

The Effect of Distraction on Fear Reduction during *In Vivo*  
Exposure for Spider-Fearful Individuals: Exploring the  
Relationship between Fear Level and Distraction Load

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This thesis is submitted as part requirement for the degree of

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### **Declaration**

I declare that this thesis is my own account of my research and contains as its main content work which has not previously been submitted for a degree at any tertiary education institution.

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2012

### **Dedication**

I dedicate this thesis to my late grandparents, Evans John Raymond Flynn (23.04.1920 - 09.06.1996), and Linda Ellen Flynn (21.06.1924 - 11.02.2011). Your influence on my life has been profound, and I only wish you were here to help me celebrate this achievement as I know you would both be so proud. I miss you both everyday.

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## **Abstract**

Exposure-based therapy is currently the treatment of choice for a number of specific phobias (Antony & Barlow, 2002). While a myriad of studies have been conducted investigating exposure characteristics, such as frequency and duration, or comparing exposure to other forms of treatment, few studies have investigated the mechanisms of change underlying fear reduction. The emotional processing model (Foa & Kozak, 1986, 1998) claims that full attention to the feared stimulus during exposure is required for fear reduction to take place. However, some studies have found that directing attention away from the feared stimulus can facilitate greater and more rapid fear reduction than exposure, where attention is directed toward the phobic stimuli (Johnstone & Page, 2004; Oliver & Page, 2003, 2008; Penfold & Page, 1999). Further, some studies have observed an interaction between fear level and distraction load, whereby high levels of fear benefit more from high-load distracters, while low levels of fear benefit more from low-load distracters or no distraction at all (Johnstone & Page, 2004, 2007c; Penfold & Page, 1999).

Study 1 investigated jointly the roles of distraction load, operationalised using a continuous performance task (CPT) and fear level over time with a sample of spider-fearful individuals. Specifically, it was hypothesised that fear level and distraction load would interact, such that participants with relatively high levels of stimulus-bound fear in exposure one would benefit more from a high-load distracter, while those with relatively low stimulus-bound fear in exposure two would benefit more from a low-load

distracter. Contrary to the emotional processing model's prediction, results demonstrated that treatment was effective for all groups, regardless of distraction load, as evidenced by within- and between-exposure session reductions in fear (as assessed by self-report, behavioural, and physiological measures of fear). Subjective ratings of anxiety demonstrated partial support for the fear level-distraction load interaction. However, results were contaminated by practice effects of the distracter for the groups with constant load across both exposure sessions and by the relatively low anxiety sample used.

Study 2 aimed to overcome the practice effects of the distraction tasks observed in Study 1 for individuals repeating the same counting task for both exposure sessions. A CPT was used to operationalise new counting tasks. These new tasks were confirmed to load equally on working memory, providing a more consistent load than that used in Study 1.

Study 3 applied the newly operationalised counting-based distraction tasks to a higher anxiety sample of spider fearful subjects in a replication of Study 1. It was again predicted that all groups would experience a reduction in fear, further supporting the beneficial effects of distracted exposure, and that the fear level-distraction load interaction would be demonstrated. Support for distracted exposure was found with both within- and between-exposure session reductions on most indices for all groups. The interaction was partially supported, as evidenced by blood pressure ratings. However, this trend did not generalise to other measures, which was attributed to

desynchrony between the physiological, subjective, and behavioural response systems. Results indicated that fear reduction can occur under distracted conditions, but did not offer consistent support for the fear level - distraction load interaction. Results are discussed with respect to both their theoretical contribution to the literature on the processing of phobic stimuli and to their implications for clinical practice.

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## Chapter 1

### **Theoretical Models of Exposure Therapy and the Changing View on the Use of Distraction in Treatment of Specific Phobia**

A specific phobia can be described as an intense, enduring fear of an identifiable object or situation that leads to anxiety symptoms, distress and avoidance (American Psychiatric Association, 1994). According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), fears evolve into specific phobias when they are persistent and excessive, lead to undue physiological arousal, cause distress and avoidance, and persist for at least six months. A recent study examining the lifetime prevalence of DSM-IV diagnoses estimates that approximately 12.5% of the population will experience a specific phobia over their lifetime, with marked gender differences towards women (15.7%) being more susceptible than men (6.7%; Kessler, Berglund, Demler, Jin, & Walters, 2005). Interestingly, this gender difference is most prominent for the animal type of specific phobia (Antony & Barlow, 2002).

Given the prevalence and severity of specific phobia symptoms and their impact on clients' quality of life, it is not surprising that a number of interventions have been developed that have been empirically supported to varying degrees. A consensus exists, however, that exposure-based therapy is the treatment of choice for a number of specific phobias (Antony & Barlow, 2002). Further, *in vivo* (or live) exposure is considered the most efficacious treatment method available for specific phobias, although imaginal



exposure remains a valid option when *in vivo* exposure is not possible (American Psychiatric Association, 1994; Antony & Barlow, 2002; Barlow, 1988).

*In vivo* exposure means that the client is asked to confront, in real life, the feared stimuli (Rosqvist, 2005). *In vivo* exposure has been used effectively to treat phobic behaviour presenting across a range of anxiety disorders (Barlow, 2002). With regard to specific phobias, several studies have deemed *in vivo* exposure to be efficacious for spider phobia (Muris, Mayer, & Merckelbach, 1998; Öst, Ferebee, & Furmark, 1997), snake phobia (Hepner & Cauthen, 1975), fear of heights (Bourque & Ladouceur, 1980), choking phobia (McNally, 1986, 1994), fear of flying (Öst, Brandberg, & Alm, 1997), and blood-injury phobia (Öst & Sterner, 1987).

Additionally, many of the studies investigating exposure therapy have focused on altering certain characteristics of the exposure, such as frequency of exposure sessions (i.e., massed versus spaced; Öst, 1989; Rowe & Craske, 1998a), the degree of therapist involvement (Hellström & Öst, 1995; Öst, Salkovskis, & Hellström, 1991), group versus individual treatment (Öst, 1996), and stimulus variation (Rowe & Craske, 1998b). Few studies, however, have investigated the mechanisms of change underlying fear reduction. Further, a disconcerting number of studies that claim to be investigating or evaluating the mechanisms of change do not use assessments that are designed to target the main mechanisms of change, lacking either cognitive evaluations, behavioural approach tasks or physiological measures (Davis & Ollendick, 2005).

Despite exposure therapy's overwhelming success as a first line treatment for people with phobic disorders, many clients fail to benefit fully from an exposure-based approach, and those who do benefit sometimes fail to maintain these treatment gains (McNally, 2007). Irrespective of the plethora of outcome studies on exposure therapy, the principles behind how and why exposure therapy works remain unclear, and there is a risk of therapists adopting alternative therapies that are better understood, yet lack a solid base of empirical support, as the pressure to narrow the gap between science and practice increases (Rosqvist, 2005). With the increased recommendation in recent years for clinicians to adopt evidence-based treatment, how can we be expected to wholeheartedly adopt an exposure treatment that we can not account for scientifically? Tryon (2005) suggests that research investigating empirically supported principles (as opposed to empirically supported treatments) for exposure therapy could focus on explanatory theories as well as testable predictions to ensure long-term widespread adoption and utilisation. In addition, Lang (1977) stipulates that in order to evaluate accurately the efficacy of a treatment modality, it needs to encompass (in a measurable way) all elements of the phobic response (i.e., physiological, behavioural, and cognitive). As highlighted in the following review, large gaps are evident within existing explanatory theoretical frameworks which impact negatively on methodologically sound change mechanism-oriented research being conducted.

## **Frameworks that Shed Light on the Mechanisms of Change**

Whilst the aim here is not to provide an exhaustive review of every theoretical model that has attempted to account for the mechanisms at play during fear reduction, it is important to outline several of the most influential, in order to examine the development of these theories over time.

### **Early (behavioural) models.**

Possibly the earliest attempt at trying to account for the mechanisms of fear reduction was Wolpe's (1958) theory of systematic desensitisation<sup>1</sup>. With this exposure treatment, the client was taught progressive muscle relaxation and was then encouraged to imagine brief anxiety-provoking scenarios of increasing intensity. Wolpe (1958) proposed that each peak in anxiety that accompanied the imagined scenarios would be met with a relaxation response that would override the anxiety. He likened anxiety responses to Pavlovian conditioned responses and the imaginal exposure as a conditioned stimulus that, when paired with a more powerful relaxation response, would weaken the original link (McNally, 2007; Wolpe, 1958).

Whilst this theory and associated treatment model was revolutionary in its day, it was not without its limitations and offers a far from comprehensive understanding of the mechanisms at play during exposure therapy. In fact, many of the behavioural models

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<sup>1</sup> It is acknowledged that systematic desensitisation is both a treatment *and* a theoretical model attempting to account for the mechanisms of change during fear reduction. It is included in this discussion due to the undeniable influence it had on providing other theorists a foundation on which to expand their models and a framework with which to empirically test them.

of exposure were concerned exclusively with whether or not the treatment worked, as opposed to how or why it worked (McNally, 2007). Davis and Ollendick (2005), in their review of empirically supported treatments, stated that it was disconcerting that so few studies testing the systemic desensitisation model had included physiological measures, especially when Wolpe's assertion was that anxiety reduction is evidenced by inhibiting autonomic response patterns (i.e., decreased physiological responding). In addition, the comprehensiveness of the model must be questioned as it remains unclear (and untestable from within this limited framework) whether physiological, behavioural, subjective, and cognitive responses can all be elicited during therapy, due to the disproportionate importance placed on physiological responding to the exclusion of the other systems. For this reason Davis and Ollendick (2005) concluded that systematic desensitisation lacks therapeutic completeness, as evidence of responding across all systems is necessary to fully capture, and explain, the change process as fear reduces in the exposure environment. Further, McGlynn, Mealiea, and Landau (1981) state that systematic desensitisation is not an *explanation* of therapeutic effects, but simply a *hypothesis* regarding the essential procedural ingredients within the technique. We need to turn to more comprehensive explanatory models to attempt to understand the underlying mechanisms. Systematic desensitisation, despite its limitations, did offer a framework that could be tested empirically in a laboratory setting and was used as a basis for some of the more recent, and more comprehensive, emotional processing models (Foa & Kozak, 1986; Lang, 1977; McNally, 2007).

### ***Habituation.***

Lader and Wing (1966) proposed the theory of habituation, which refers to a “decline in fearful reactions, particularly psychophysiological aspects of fearful reactions, with repetitive exposure to fear-provoking stimulation” (Barlow, 1988 , p. 287). In other words, it simply refers to the reduction in response strength over repeated encounters with the feared stimuli. The basic premise of the model is that the rate of observed reduction on physiological measures (such as galvanic skin response) reflects the extent of the anxiety reduction that has occurred (Watts, 1979). Habituation is considered to be relatively short-term, with physiological responses returning after a short break (Barlow, 1988). The learning underlying habituation is considered a fundamental or basic process and does not require conscious motivation or awareness to occur (i.e., it is concerned with unconditioned responses).

As habituation is exclusively concerned with decreases in physiological arousal, it does not encompass (or concern itself with) the other two systems that compose the phobic response (i.e., subjective reports of fear and behavioural avoidance; Lang, 1977). It is not uncommon for desynchrony to occur between these systems such that even if physiological indices do demonstrate decreased arousal, measures of subjective fear and avoidance may show little improvement or vice versa (Barlow, 1988), further bringing into question the comprehensiveness of the habituation model. Finally, Tryon (2005) in

his review of existing theories, concluded that the fact that habituation is temporary and reversible makes it unable to account for long term changes in anxiety response.

### ***Extinction.***

Extinction refers to a decrease in learned responding through repetition of unreinforced responding (Barlow, 1988), in other words, when individuals repeatedly encounter the feared stimuli in the absence of feared consequences. Watts (1979) states that contrary to habituation, which is focused on unconditioned responses and is a temporary change in responsiveness, extinction is concerned with conditioned responses and long term change. In addition, extinction is primarily concerned with behavioural avoidance as the primary dependent variable, in contrast to habituation which is primarily concerned with physiological responses. New learning, which stems from the process of an individual staying in the situation for an extended period without the feared consequences occurring, is thought to be an “active” as opposed to a “passive” process and, in this sense, has something in common with cognitive models of anxiety reduction that focus on information processing (Barlow, 1988). The difficulty remains in acknowledging this active learning process, as to do so would mean that extinction would be better categorised as a cognitive-behavioural theory (Tryon, 2005). Given that strict behavioural explanations preclude the presence of mediating factors (e.g., active learning that involves cognitive processes), it remains firmly placed within a behavioural explanatory context that restricts its ability to account for mechanisms underlying fear reduction.

Extinction theory is certainly better able to account for the longer-term reductions in fear, and is able to explain findings that indicate longer exposure sessions that are spaced more closely together result in fewer behavioural symptoms of anxiety at follow up (Marshall, 1985). The theory does, however, have great difficulty accounting for those studies demonstrating that “escaping” prior to reaching maximum fear level can still result in anxiety reduction (Emmelkamp, 1982; Rachman, Craske, Tallman, & Solyom, 1986). That is, if individuals have not officially “learnt” that the feared consequences do not occur in the presence of the feared stimuli, then how does anxiety reduce? Despite its popularity as an explanation of anxiety reduction, few studies have tested the adequacy of this theory and Tryon (2005) states that, although extinction describes a relationship between response decrement and absence of reinforcement, it does not adequately explain why this relationship exists and, therefore, cannot be considered a comprehensive model to explain fear reduction.

### **Cognitive models.**

Theories stemming from the cognitive school of thought propose that fear is maintained through dysfunctional thinking patterns about the stimulus (J. S. Beck, 1995). Additionally, they generally propose that altering an individual’s thinking about the feared stimulus will, in turn, reduce their fear. Several cognitive theories have attempted to account for the mechanisms underlying fear reduction, such as perceived danger (A. T. Beck, Emery, & Greenberg, 1985), over-prediction of fear (Rachman, 1994), and the general expectations that occur when one undertakes treatment (i.e., placebo effect). Possibly the most empirically investigated cognitive theory with regard

to the mechanisms of fear reduction, however, is self-efficacy theory (Bandura, 1986). This will be discussed briefly before moving onto the emotional processing models that have dominated our understanding of fear reduction mechanisms for some time.

Self-efficacy can be defined as "the conviction that one can successfully execute the behaviour required to produce the desired outcomes" (Bandura, 1977 , p. 193). It refers to an individual's sense of competence in mastering (or coping with) a particular task or challenge; in other words, their belief in their ability to cope. Bandura (1983) proposed that increasing one's self-efficacy is the primary outcome of successful treatments for anxiety. It is believed that dysfunctional beliefs about one's inability to cope creates distress and impairs one's resultant level of functioning (Ozer & Bandura, 1990). Further, Kent and Gibbons (1987) found that it is not the actual frequency of negative cognitions *per se* that is a major source of anxiety arousal, but rather the strength of perceived self-inefficacy to control the escalation or perseveration of these cognitions. Unlike the models discussed above, which focus on fear reduction taking place due to the actual processing of the feared stimulus, self-efficacy theory purports that it is improvements in dysfunctional (low self-efficacy-related) thoughts that bring about anxiety reduction.

Tyron (2005) highlighted that it is understandable from a self-efficacy perspective that progression through a gradual exposure hierarchy improves self-efficacy, as the individual's confidence increases in line with more intense exposure to the feared stimulus. He argues, however, that self-efficacy theory fails to account for those occasions where self-efficacy improves, yet anxiety remains. For instance, an



early study by Rachman (1983) that analysed personality traits of military bomb-disposal operators found that a small percentage of soldiers continued to experience intense anxiety responses despite a strong sense of perceived competence and self-efficacy. Tryon (2005) also raises the point that when fear does not reduce in conjunction with increased self-efficacy (as was the case in the above-mentioned study), then encountering the feared stimuli would reaffirm one's phobic response: one's original set of expectations about inability to cope, resulting in an anxious response, therefore reinforcing one's original dysfunctional beliefs relating to low self-efficacy. In addition, studies have demonstrated that changes in self-efficacy ratings predicted self-reported anxiety but did not predict changes in physiological and behavioural measures (Lane & Borkovec, 1984). Given these limitations, self-efficacy theory lacks the explanatory force needed to offer a comprehensive model of anxiety reduction.

### **Summary of behavioural and cognitive models of fear reduction.**

The behavioural models discussed above do not provide a sufficiently cohesive and comprehensive model to adequately account for fear reduction. They are oversimplified and tend to focus more on *outcome* as opposed to *process*. Collectively, these models struggle to account for the return of fear post-exposure treatment, the beneficial effects of flooding, and desynchrony between response systems.

Cognitive models appear to have difficulty in establishing empirically whether changes in cognition (e.g., self-efficacy) are the cause of anxiety reduction or the effect of anxiety reduction. This is partly due to cognitive change being such a slow process

that may not be limited to the confines of the treatment sessions, making direct observations and prediction testing quite difficult. In addition, direct testing of cognitions is fraught with difficulty due to the reliance on self-report measures. The self-efficacy model also struggles to account for those instances where high self-efficacy does not necessarily result in a reduction in anxiety (Rachman, 1983).

A major criticism of both the cognitive and behavioural models and their associated treatments is that they primarily focus on one outcome measure as opposed to an emphasis on measuring other factors comprised in the phobic response (i.e., behavioural, cognitive, and physiological habituation; Davis & Ollendick, 2005). Tryon (1995) highlights the longstanding reluctance of cognitive theorists to be open to behavioural models of fear reduction and also the reluctance of behaviourists to take on cognitive principles. When this divide in the psychological community is considered, with respect to developing a cohesive theoretical model that can more fully account for the underlying mechanisms of fear reduction, it is little wonder that the models discussed thus far seem to be able to only account for the cognitive *or* behavioural component depending on their theoretical origin.

### **Emotional processing models.**

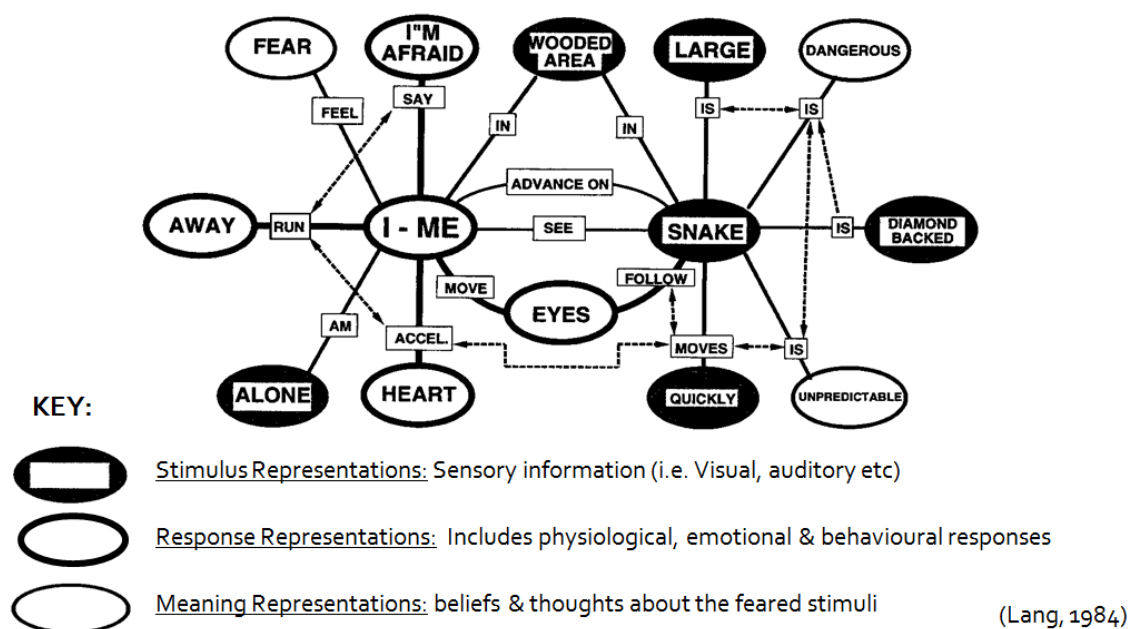
It is essential to review the emotional processing models of fear to first establish what these models can account for and, secondly, to establish what they have difficulty explaining. The most influential of these models is Foa and Kozak's emotional processing model (Foa & Kozak, 1986, 1998), which is based on Lang's

bioinformational theory of emotion (Lang, 1977, 1984), and Rachman's (1980) theory of emotional processing.

Lang (1977, 1984) proposes that fear is represented by a network structure in long-term memory (see Figure 1.1. for an example of a snake phobia network structure) that is made up of three different components: stimulus representations, response representations, and meaning representations. Stimulus representations refer to the sensory processing of feared stimuli (i.e., what we can see or hear, etc). Response representations refer to the physiological, cognitive, and behavioural responses to the feared stimuli. Finally, meaning representations refer to the beliefs and thoughts about the feared stimuli. The model assumes that any input from the environment that matches any of these representations in the network can activate the network and, hence, also activate the fear response. The more tight-knit or cohesive the network, then the more sensitive it is to activation. Also, the more closely and accurately the input resembles the representations in the network, the more likely fear is to be activated. For someone with a phobic level of fear about snakes, for instance, it would take activation in only one area of the network (e.g. being in a wooded area) to activate the entire network, resulting in a severe anxiety response (Lang, 1977, 1984).

Rachman (1980) built upon Lang's model by conceptualising emotional processing as a process where emotional disturbance is absorbed and diminished, and can be evaluated by the extent to which other experiences and behaviours can proceed without disruption. He postulated three criteria that would be indicative of successful

emotional processing: a) evidence of emotional disturbance, b) a subsequent decline in disturbance, and c) evidence of a return to normal undisrupted behaviour (Rachman, 1980).



*Figure.1.1.* Example of an emotion network (snake phobia) as proposed by Lang (1984).

He used “test probes” to determine the extent of emotional processing by presenting the phobic stimulus to an individual and assessing the degree to which the original emotion was re-evoked. Thus, effective emotional processing is evidenced by an individual’s contact with a previously anxiety-provoking stimulus without experiencing or displaying signs of distress. Rachman’s (1980) model was able to shed light on the “return of fear” post-exposure therapy (for which neither habituation nor extinction were able to adequately account), which he viewed as incomplete emotional processing. Whilst Rachman’s model offers a conceptual description of emotional processing, it does not shed light on the mechanisms by which fear reduces. Rachman

(2001), in a later review of his model, recognised that the original model did not acknowledge cognitive influences on processing and he attributed this to the behavioural climate in which the model was developed. Rachman (2001) has since acknowledged the influence of an individual's beliefs and appraisals, proposing that misinterpretations and erroneous beliefs can impede emotional processing. Rachman's model has been accused of being circular in reasoning in that the fear reduction that is attributed to effective emotional processing is the same evidence used to conclude that effective emotional processing has occurred (Foa, Huppert, & Cahill, 2006). Rachman represents one of the pioneers of the emotional processing frameworks, but his model lacks explanatory power and, as such, is unable to shed light on the mechanisms of change that underlie fear reduction.

***Foa & Kozak's emotional processing model.***

Foa and Kozak (1986, 1998) have used the central tenets of Lang's (1977, 1984) and Rachman's (1980) models on which to base their emotional processing model, that attempts not only to describe emotional processing, but explain the phenomena as well. Foa and Kozak's model claims that for fear reduction to occur during exposure, first fear must be activated. They propose that fear activation occurs when there is a match between the phobic input from the environment and a representation in memory, which is evidenced by physiological arousal. Failure to activate the network implies that the fear structure has not become available for modification and effective emotional processing cannot occur. According to the model, activation can be established by assessing an individual's physiological reactivity, their subjective reports of their fear,

and apparent behavioural avoidance (Foa & Kozak, 1986; Lang, 1977). It is proposed that more intense phobias (that are characterised by more coherent and stronger network links) require little matching information to activate, and spread throughout the network. Then, during exposure to the feared stimulus, new corrective information about the probability of harm (that is incompatible with the fear-saturated information already in the network) must incorporate itself into the network. This modification of the fear structure is believed to take place only when this incompatible information is available for network-integration and is believed to emerge initially as a result of short-term, within-session habituation. As this incompatible information is integrated into the network, Foa and Kozak (1986) propose that the links between the various representations in the network weaken and break. This ongoing process of integrating incompatible information into the network, the subsequent reduction of the perception of harm, in conjunction with a reduced physiological reactivity, results in between-session habituation.

Foa and Kozak (1986) also place emphasis on assessing the *process* of fear reduction as opposed to merely the *outcome*, by monitoring the indices of emotional processing at various points throughout the exposure (i.e., self-report and physiological measures). They propose that indicators of emotional processing will be evident in measures taken at the beginning of exposure (to assess activation), within exposure sessions and between sessions (Foa & Kozak, 1986). Successful emotional processing will then lead to the formation of a new memory, weakened links between the stimulus and response elements and, ultimately, a decreased emotional response.

A particular criticism of Foa and Kozak's model comes from McNally (2007), who suggests that the emotional processing model merely restates the phenomenon it is trying to explain. He provides the example of agoraphobic clients who, according to the emotional processing model, have response propositions regarding internal somatic sensations that are linked to meaning propositions in the network regarding danger (i.e., harm coming from these sensations). McNally claims that this is merely stating what clinicians have known all along (i.e., agoraphobic clients fear physical sensations) but is simply being put in different terms.

Another difficulty with Foa and Kozak's emotional processing model is the ambiguity inherent in trying to "match" or recreate a feared stimulus that will effectively activate the fear network. For instance, particularly with *in vivo* exposure, matching characteristics of a typically anxiety-provoking scenario for a spider phobic in a clinical setting is no easy task. Even outside of an office-based environment, recalling the specific elements of a spider-related scenario that would inevitably invoke fear is difficult, and assumes the client has ready access to this information in their fear network. In addition, the reliance on physiological measures, as primary means of assessing whether a "match" has occurred and fear is being activated, is problematic due to the large variability in physiological measures.

In addition, Foa and Kozak (1986, 1998) also struggle to account for the growing literature indicating that using a form of distraction during exposure (as opposed to

completely focusing on the feared stimulus) can result in more rapid fear reduction both during the exposure session and at follow-up than focused exposure (Johnstone & Page, 2004; Oliver & Page, 2003). The emotional processing model would predict a deleterious effect of distraction, based on Foa and Kozak's requirement of full attention to the feared stimulus for fear reduction to occur. The difficulty in accounting for these recent findings renders the emotional processing model subject to further scrutiny and, at the very least, a review of their proposed mechanisms in light of the distraction literature.

#### **Formal network theory.**

Prior to commencing a review of the distraction literature, it is worth mentioning one further potentially explanatory model of the mechanisms underlying fear reduction during exposure therapy. Stemming from evidence from the field of behavioural neuroscience, Tryon (2005) proposed a connectionist learning-memory mechanism that he believes offers a means by which to not only explain, but also directly test the mechanisms of fear reduction during exposure. He has criticised other network-based models for not being specific enough about the network structure, how different parts of the fear network are linked, and how these links between these aforementioned parts alter in response to treatment (Tryon, 2005).

According to Tryon's connectionist model, the fear network comprises three layers of nodes. The top layer of nodes represents the stimulus input (i.e., sensation and perception), the second layer of nodes represents the cognitions and emotions, and the



third (bottom) layer represents behaviour. Within this network, each node is only connected to the layer of nodes right next to it, meaning that there are no direct connections between the top and bottom layers (Tryon, 1995). Activation across the network flows downwards from the top (sensory) layer to the bottom (behavioural) layer as information processing occurs.

Tryon (1995) describes an excitatory or inhibitory process that occurs throughout the network based on prior learning. He proposes that excitatory connections represent positive weights, whereas inhibitory connections represent negative weights, and these connection weights dictate differential emphasis of stimulus characteristics and, therefore, determine what the network thinks and feels about stimulus events (i.e., encounters with the feared stimulus; Tryon, 2005). During exposure, it is proposed that dissonance is created in the network by having the person behave in a therapeutic way by being in the presence of the feared stimuli and not escaping. In this sense, the sensory (positively weighted) connections conflict with those of the behavioural (negatively weighted) connections. In an attempt at nullifying or ridding itself of this dissonance in the presence of the new non-escaping behaviour, the network reconciles this dissonance by adapting the synaptic weights, resulting in new learning. As this process occurs again and again, and the network consistently endures a dissonance followed by reconciliation process, emotional and cognitive change results (Tryon, 2005).

A strength of the formal network theory is that it claims that cognitions, emotions, and behaviours change simultaneously, thereby integrating and unifying cognitive, behavioural and emotional models. This is in contrast to behavioural models, that claim that changes in behaviour precede changes in cognition and emotion, cognitive models, that claim behavioural and emotional change follows changes in cognition, and affective models, that predict that emotional changes precede and mediate cognitive and behavioural changes (Tryon, 2005).

Whilst formal network theory offers an exciting new explanation of the mechanisms of change, it has been criticised for being too complex, in that it is difficult to explain verbally and requires a computer simulation to fully articulate its premise, track changes and make predictions (Tryon, 2005). Tryon acknowledges that a balance must be reached where models are complex enough to capture essential characteristics but simple enough to be properly studied. Many psychologists do not have the mathematical background to understand and empirically investigate network theory in a way that meaningfully contributes to understanding the mechanisms at play during fear reduction. For this reason, it unfortunately remains likely that this model will remain more of a theoretical premise than a functional, testable model for some time.

The theoretical models reviewed here, provide an overview of existing frameworks, and shed light on the origins and rationales behind our current understanding of how fear reduction occurs. Many of the models, outlined above, remain largely descriptive and unable to account for recent advances in exposure

research that investigate the use of distraction during the exposure process. It is likely that such empirical advancements will force a review of the above-mentioned theoretical models and lead to the expansion of existing models, or development of new models, that possess more explanatory power and focus on understanding how change occurs, rather than simply describing it.

### **Review of the Clinical Relevance of the Distraction Literature**

Research investigating distraction stemmed from a desire to want to know more about the optimal treatment conditions during exposure. There is no universally accepted definition of distraction currently in existence but, within the distraction literature, it refers to the process of directing a person's attention away from the feared stimuli. Within the literature, distraction is often categorised as either visual (involving a distracting task that interferes with an individual's ability to *look* at the feared stimuli) or cognitive (involving a distracting task that interferes with the individual's ability to *think* about the feared stimuli). Regardless of the type of distraction in question, there is a longstanding belief, that exists within the literature, that distraction inhibits the processing of aversive information and impacts negatively on fear reduction (Haw & Dickerson, 1998).

Existing theories of fear reduction, outlined above, cannot adequately account for studies that demonstrate a beneficial effect of distraction. The emotional processing model, in particular, argues that anything other than full attention to the feared stimulus during exposure will impede anxiety reduction (Foa & Kozak, 1986). Further,

distraction is viewed as “fear-irrelevant” information that interferes with the availability of incompatible information, hence making it less likely that corrective information is incorporated into the fear network, in turn resulting in less fear reduction. Prior to a more in-depth review of the theoretical position of these models on the use of distraction, it is necessary to discuss the clinical importance of investigating distraction and review the findings of the distraction studies to date.

It has been suggested that the natural tendency for anxious individuals is to engage in distraction in order to avoid or escape from the feared stimulus (Craske, Street, Jayaraman, & Barlow, 1991; Mohlman & Zinbarg, 2000). It has been documented that some therapists tend to use distraction techniques during exposure, in order to increase coping and reduce anxiety by directing attention away from the phobic stimulus (Craske, Street, & Barlow, 1989). Distraction has also been used to assist the client in staying in the exposure session longer and managing anticipatory anxiety (Clark, 1999; Craske et al., 1989; Craske et al., 1991). Other clinicians advise against its use in an exposure protocol, arguing that distraction might impact negatively on fear reduction by strengthening avoidance and escape behaviour (Andrews et al., 2003). Craske and Barlow (2008), in their review of treatments for panic disorder and agoraphobia, regard distraction as “disrupted” exposure. If distraction is a process that individuals engage in when they encounter a feared stimulus, either within a clinical environment as part of exposure therapy, or outside in their natural environment, then it is important to establish what effect this has on the reduction or maintenance of the fear being treated. Clinical use of distraction techniques, as part of exposure therapy for

anxiety disorders, has preceded empirical research supporting whether and to what extent they prove helpful to various client populations. With the ever increasing emphasis on evidence-based practice within the psychological community, it is imperative that the boundaries of the clinical usefulness of distraction be operationalised, so as clinicians, we can ensure the best quality of care for our clients.

A trend exists across the distraction literature to investigate the impact of focusing attention *toward* the phobic stimulus as opposed to distracting attention *away from* the phobic stimulus. Results from studies investigating the effect of distraction during exposure are varied in many ways making it difficult to compare and contrast them in a way that is valid, meaningful and clinically relevant. The distraction literature is reviewed below and will be categorised into research that has shown detrimental effects, mixed effects, and beneficial effects. A summary of the distraction literature can be seen in Table 1.1.

Table 1.1. *Review of Studies Investigating Effects of Distraction during In Vivo Exposure for Anxious Populations*

Authors (year)	Anxious Pop.	Distraction type	S-T effects	L-T effects	Attention checks
Grayson, Foa, & Steketee (1982)	**OCD	Visual/Cognitive	No effect (SUD or HR)	Detrimental (SUD) No effect (HR)	NO
Grayson, Foa, & Steketee (1986)	**OCD	Visual/Cognitive	Beneficial (SUD ) Detrimental (HR)	No effect (SUD) No effect (HR)	NO
Craske, Street, & Barlow (1989)	**Panic & Agoraphobia	Cognitive	Beneficial (composite index)	Detrimental (composite index )	YES (cognitive) Self Report only
Craske, Street, Jayaraman, & Barlow (1991)	**Animal	Cognitive	Beneficial (SUD ) No effect (HR)	Not assessed	YES (cognitive) Self Report only
Rodriguez & Craske (1995)	*Animal	Visual	Detrimental (SUD) No effect (HR & BAT)	Not assessed	YES (self report of affective content)
Haw & Dickerson (1998)	*Animal	Visual +/-or Cognitive	No effect (SUD or HR)	Detrimental (SUD & HR)	NO
Penfold & Page (1999)	*Blood Injury	Cognitive	Beneficial (+SUD) No effect (BAT)	Not assessed	YES (visual & cognitive)
Mohlman & Zinbarg (2000)	*Animal	Visual +/-or Cognitive	Detrimental (SUD) No effect (HR & BAT)	Detrimental (SUD) No effect (BAT)	YES (visual & cognitive) Self report only
Kamphuis & Telch (2000)	*Claustrophobic	Cognitive	Detrimental (SUD between-sessions) No effect (HR)	Detrimental (SUD) No effect (HR)	YES (cognitive self report & error %)
Antony, McCabe Leeuw, Sano, & Swinson (2001)	**Animal	Cognitive	No effect (SUD, BAT, HR)	Not assessed	YES (cognitive - test of knowledge re: distracter)

Authors (year)	Anxious Pop.	Distraction type	S-T effects	L-T effects	Attention checks
Oliver & Page (2003)	*Blood Injury	Cognitive	Beneficial (SUD ) No effect (HR, BP)	Beneficial (SUD )	YES (#visual = & self report; #cognitive)
Telch, Valentiner, Ilai, Young, Powers, & Smits (2004)	*Claustrophobia	Cognitive	Detrimental (SUD) No effect (HR)	Not assessed	NO
Johnstone & Page (2004)	**Animal	Cognitive	Beneficial (+SUD, FSQ & BAT)	Beneficial (SUD, FSQ, BAT)	YES (#visual & #cognitive)
Schmid-Leuz, Elsesser, Lohrmann Jöhren, & Sartory (2007)	**Dental	Cognitive	Detrimental (SUD)	Detrimental (state anxiety & dysfunctional cognition scores) No effect (HR) No effect (avoidance)	NO
Oliver & Page (2008)	*Blood Injury	Cognitive (internal vs. external)	Beneficial (SUD & BAT)	No effect (SUD) Beneficial (BAT)	YES (#visual & #cognitive)
Johnstone & Page (2007b)	**Animal	Cognitive	Beneficial (+SUD high anxiety) Detrimental (SUD low anxiety) No effect (BAT, HR, BP)	Not assessed	YES (#visual = & self report; #cognitive = & self report)
Johnstone & Page (2007c)	**Animal	Cognitive (high-load vs. low-load)	Beneficial (+SUD, BAT, HR, BP)	Beneficial (BAT) No effect (SUD, BAT)	YES (#visual = & self report; #cognitive = & self report)

*Note:* \*\*Clinical sample. \*Non-clinical sample. #Objective check of attention. +Interaction between anxiety level and distraction load. S-T: short-term. L-T: long-term. HR: Heart Rate. SUD: Subjective Units of Distress. BAT: Behavioural Approach Task. BP: Blood Pressure. FSQ: Fear of Spiders Questionnaire.

### **Distraction as detrimental to fear reduction.**

Some studies have found that the use of distraction during exposure has had detrimental effects on fear reduction. Rodriguez and Craske (1995) used distracting slides and presented them in the visual fields of animal phobic participants. When the intensity of the exposure was higher (i.e., more fear provoking), higher self-reported anxiety ratings were reported for those participants undergoing distracted exposure, compared to the non-distraction group. This trend, however, did not generalise to heart rate and behavioural measures of anxiety, as both groups performed similarly on these measures.

Mohlman and Zinbarg (2000) hypothesised that participants who focused both visually and cognitively on the feared stimuli (i.e., a live tarantula) would demonstrate significantly greater fear reduction than participants who were either visually or cognitively distracted (or both). This hypothesis was confirmed in that participants who were completely focused on the feared stimuli showed greater anxiety reduction, as measured by more steps achieved on behavioural approach tasks (BATs). Results must be interpreted with caution, however, as fear activation did not occur for all groups (as evidenced by subjective and heart rate measures), nor was there conclusive evidence of within-sessions fear reduction (as measured by heart rate). In addition, between-session reductions in fear (which represents longer-term emotional processing) was not assessed, as participants only underwent one exposure session. It should be noted that there is some contention as to whether physiological activation and between-session habituation are necessary, because some studies have found these criteria to be



predictive of poorer longer-term outcome with regard to fear reduction (Craske & Barlow, 2008; Rowe & Craske, 1998a, 1998b). Mohlman and Zinbarg (2000) concluded that, whilst visual or cognitive distraction might provide a more comfortable exposure environment for the participant, its use may actually impede fear reduction in the long term.

In another key study, Kamphuis and Telch (2000) used a sample of claustrophobic participants to investigate the influence of cognitive factors on fear reduction. Participants engaged in a demanding dual process cognitive load task (i.e., performing two tasks simultaneously whilst listening and responding to number sequences) as a form of distraction. Adherence to the task was assessed by calculating the participants' hits and misses on the dual task. Results demonstrated that groups undergoing cognitive distraction (as opposed to focusing on threatening components of the feared stimuli) demonstrated less fear reduction at post treatment (as assessed by self report anxiety ratings), although there was no difference between conditions on heart rate. The results also carried through to the follow-up session two weeks later. The authors concluded from these results that, in keeping with the emotional processing theory, greater fear reduction takes place when individuals allocate maximum available attentional resources to the feared stimuli. More generally, the authors concluded that accessibility to "safety aids", such as distraction, are detrimental to exposure-based treatments. They note that any potential short-term relief reported by individuals using these safety aids is likely due to inadequate activation of the fear network and is, therefore, likely to disrupt between-sessions habituation and disconfirmation of perceived threat. Consequently,

they recommend therapists to pay attention to their clients' use of such safety strategies and discourage their use.

In an attempt to further establish the boundary conditions of distraction, Telch, Valentiner, Ilai, Young, Powers, and Smits (2004) investigated another sample of sub-clinical claustrophobics and used a variety of attentional demand tasks to further assess the impact of distraction on fear reduction. Participants were allocated to one of four groups that undertook a 30-minute exposure session while at the same time either attending to threat-related words and associated mental images, attending to neutral words and associated mental images, undertaking a demanding cognitive load task that involved listening to beeps and identifying/reporting on similarities in tone, or undergoing exposure alone with no additional tasks. Telch et al. (2004) predicted that participants who focused on threat words whilst undergoing exposure would demonstrate greater physiological activation than the other groups and would, in turn, experience greater fear reduction. They also predicted that the group undergoing the cognitive load task would experience the lowest physiological activation and would experience the least reduction in fear. Results indicated that the control group (who underwent exposure alone) experienced the greatest reduction in self-reported fear and the cognitive load condition reported the least reduction in fear. There was no significant difference in the rate of between-sessions fear reduction, nor was there a difference in the rate of physiological activation between conditions. This study conceptualised the cognitive load task as the true "distraction" condition; however, groups in the neutral word condition were still engaging in a form of distraction, albeit

passive as opposed to active, making drawing solid conclusions about group differences difficult due to this ambiguity.

More recently, Schmid-Leuz, Elsesser, Lohrmann, Jöhren, and Sartory (2007) conducted a study examining dental phobic clients who underwent exposure treatment either focused (handling dental instruments and thinking about their function) or distracted (handling dental instruments whilst playing puzzle games with the therapist). Participants were required to attend one 60-minute exposure session where their responses to various questionnaires, heart rate, subjective units of distress (SUD) and behavioural approach task (BAT) performance were monitored. They attended a follow-up session one week later where the same measures were taken again. Results demonstrated a marginally significant advantage for the distracted group's anxiety reduction (as measured by SUD). The focused group, however, showed a greater decrease in state-anxiety scores (as measured by the State Trait Anxiety Inventory) and dysfunctional cognitions (as assessed by the Dental Cognitions Questionnaire). Reductions in heart rate did not significantly differ between groups, nor did avoidance (measured by compliance with dental regime over the following 6 months). A major limitation of this study is that no manipulation checks were used to assess visual and cognitive attention. Whilst the therapist remained present throughout each exposure session, there were no objective or self-report checks of visual attention to ascertain the degree of visual attention throughout the entire exposure duration. More importantly, there was no check of cognitive attention, so it remained unclear the extent to which attentional resources were being allocated to thoughts about the dental instruments in the

focusing condition, or playing puzzle games in the distraction condition. It is, therefore, possible that participants may have engaged in cognitive avoidance in the focusing condition or attended to the feared stimuli in the distracted condition, thus compromising the experimental manipulation and rendering the findings of this study questionable.

### **Mixed distraction findings (short-term versus long-term).**

Grayson, Foa, and Steketee (1982) were among the first researchers to empirically investigate the effects of distraction during exposure with a group of obsessive compulsive clients. A within-subjects design was employed where individuals underwent exposure to their feared contaminant while either engaging in stimulus-relevant conversation with the therapist (focusing), or playing video games (distraction). Participants completed one exposure session per day for two days, changing experimental condition after the first day. Both groups demonstrated within-session decreases in SUD ratings at the end of the first day of exposure treatment. However, the participants who changed into the focusing condition on day two (having just undergone distracted exposure on day one) showed little between-session habituation with regard to SUD, indicating that treatment gains were not maintained from the previous day's (distracted) exposure treatment. With respect to heart rate, both groups demonstrated comparable reductions from day one to day two. Contrary to predictions, distraction appeared to have little effect on SUD ratings, when compared to focused exposure, with respect to within-session fear reduction, but appeared to impact negatively on between-session fear reduction.

When this study was replicated in 1986, a between-subjects design was used instead, and the distraction condition demonstrated a greater within-session reduction in SUD ratings, than the focused condition (Grayson et al., 1986). Heart rate data, by contrast, demonstrated a greater within-session reduction for participants in the focused condition. There were no differences between groups for either SUD ratings or heart rate at the two-day follow-up. Irrespective of SUD ratings demonstrating a beneficial effect of distraction, the authors concluded (based on heart rate data alone) that the use of distraction was detrimental to fear reduction.

Craske et al. (1989) examined the effects of distraction during exposure for individuals suffering panic disorder with agoraphobia. The focusing group was instructed to actively focus on the monitoring of bodily sensations and fear-related thoughts throughout exposure, while at the same time using thought stopping and focusing self-statements to interrupt distraction. The distraction group was instructed to use various distraction techniques, such as word rhymes and spelling tasks, during exposure and was also instructed to use thought stopping techniques throughout, to prevent focus on bodily sensations and fear-related thoughts. Results demonstrated that the distracted group demonstrated greater improvement than the focused exposure group at the end of treatment. However, individuals in the focused exposure group improved to a greater extent over the 6-month follow-up period.

Haw and Dickerson's (1998) study also demonstrated mixed findings with their spider-fearful participants. During exposure, participants were allocated to one of four

experimental groups that were either required to read words aloud, visually track an object, perform both tasks (visually tracking an object whilst reading words aloud), or a control group (where there was no distraction task and participants were required to visually and cognitively focus on the spider). Both subjective reports of anxiety (SUD) and heart rate were used to measure fear reduction throughout the exposure sessions. Results indicated that the treatment conditions did not significantly differ on either measure and anxiety reduced at a similar rate for all groups. At the follow-up session later that day, individuals in the distracted condition demonstrated more fear than those who underwent focused exposure. The results of this study were limited by the lack of visual checks (e.g., eye movements) and cognitive checks (e.g., task performance), and although the findings appear mixed with regard to short-term versus long-term effects of distraction, they must be interpreted with caution.

It is likely due to some of the early findings demonstrating a detrimental effect of distracted exposure (such as Grayson et al., 1982, 1986 ; notwithstanding methodological limitations) in conjunction with the emergence of the highly influential emotional processing model (Foa & Kozak, 1986), which predicted negative effects of distraction, that researchers concluded that the use of distraction during exposure caused the return of fear post-exposure treatment. Short-term beneficial effects of distraction, but an increase in fear at follow-up, have been attributed to the limiting of the salience of the feared stimuli during the exposure session (i.e., inadequate processing). Nevertheless, whilst Grayson et al. (1982) documented a short-term distraction advantage, followed by an increase in the return of fear for participants undergoing

distracted exposure, their follow-up study (1986) demonstrated a return of fear for both focused and distraction conditions. Consistent with this finding, Craske et al. (1989), found no significant difference between focusing and distracted conditions at 6 month follow-up, rendering it unlikely that a direct causal relationship exists between distracted exposure and return of fear, as was once proposed.

### **Distraction as having no effect or a beneficial effect on fear reduction.**

Antony, McCabe, Leeuw, Sano, and Swinson (2001) found neither a beneficial nor a detrimental effect of distraction, when examining a sample of spider phobic individuals. The distraction task used in their study was an audio tape about world geography that participants were later tested on as a check of attention. Whilst all participants' anxiety improved from pre- to post-exposure treatment on subjective self-report ratings, BAT and heart rate, indicating that exposure was indeed effective, there were no group differences found between those undergoing focused versus distracted exposure. The authors acknowledged that the choice of distracter in this study was difficult to operationalise in terms of its distractibility, but, regardless of this confound, results did not demonstrate a detrimental effect of distraction. Although a beneficial effect was not found, this finding still remains theoretically important, as existing models of fear reduction have difficulty accounting for these neutral findings.

Craske et al. (1991) conducted one of the first studies to report on the potential beneficial effects of distraction when they assessed an animal-fearful population (i.e., individuals fearful of snakes and spiders). Eleven group sessions were conducted where

participants were assigned to a focusing condition, a distraction condition, or a control group. Participants in the focused condition showed higher levels of subjective fear at the end of treatment than either the distraction group or the control group, which did not significantly differ from each other. Return of fear at follow-up, however, was not assessed in this study. These results indicate (at least in the short-term) that distraction does not have a detrimental effect on fear reduction.

More recently, a series of studies have been conducted that have exhibited consistency in both procedures and distraction type, and have yielded more consistent findings demonstrating positive effects of distraction during exposure. Penfold and Page (1999) improved on some of the shortfalls of previous research by examining a method of distraction that has clinical relevance and utility (i.e., stimulus-irrelevant conversation). They also included objective measures of visual and cognitive attention, which previous studies had not done. Undergraduate students who had at least a mild fear of blood-injury stimuli were allocated to either an exposure plus distraction group (described above), an exposure plus focusing group (who were engaged in stimulus-relevant conversation throughout the exposure) or an exposure only group (who were instructed not to engage in any conversation during exposure). Results demonstrated that a greater within-session reduction in subjective reports of anxiety occurred for those participants in the exposure plus distraction condition than either exposure plus focusing or exposure alone. No group difference existed on behavioural measures of anxiety. It has been argued that this within-session distraction advantage reflects reduced activation of the fear network, and consequently represents a longer-term disadvantage as it



disallows adequate modification of the fear structure and, ultimately, corrective information does not integrate effectively (Foa & Kozak, 1986, 1998). As Penfold and Page (1999) only examined changes in anxiety within a single session, between-sessions reductions in fear could not be assessed.

Given that the emotional processing theory posits that long-term fear reduction (as assessed by between-sessions changes in fear) will be negatively impacted by distraction, in a follow-up study, Oliver and Page (2003) improved upon the previous study by assessing the effect of distraction on both within- and between-sessions fear reduction. Participants attended three separate weekly exposure sessions, followed by a follow-up exposure session one month later. Participants were assigned either to an exposure plus focusing condition (engaging in stimulus-relevant conversation), an exposure plus distraction condition (engaging in stimulus-irrelevant conversation), or exposure alone (no conversation). Results demonstrated that participants undergoing distracted exposure showed greater within- and between-session fear reduction than participants in either of the other experimental groups.

Oliver and Page (2008) aimed to extend their earlier findings, attempting to determine whether the distraction advantage would still hold, even when the topic of conversation was the participants' internal emotional state. They acknowledged that the "focusing" conditions employed in many previous studies may be somewhat distracting in and of themselves, due to focused conversation being related to the observable aspects of the feared stimuli, rather than the participants' reactions to it. In this sense,

the distraction advantage found in previous studies could potentially be explained away, due to this possible “confound” when groups undergoing focused exposure were compared to distraction groups.

In their more recent study, aimed at overcoming this proposed confound, Oliver and Page (2008) had blood-injury fearful participants attend three exposure sessions spaced a week apart. Participants were randomly allocated to one of the following groups: exposure plus internal focus (engaging in conversation related to threatening internal physiological cues), exposure plus external focus (engaging in conversation related to threatening thoughts and feelings of the external environment, i.e., the feared stimulus), exposure plus internal distraction (engaging in conversation related to non-threatening or neutral internal physiological cues), exposure plus external distraction (engaging in conversation related to neutral topics unrelated to the feared stimulus), or exposure alone. Consistent with earlier findings, such as Penfold and Page (1999) and Oliver and Page (2003), groups undergoing distracted exposure demonstrated greater improvement in anxiety ratings both within- and between-sessions than focusing conditions and exposure alone. It was also found that this treatment advantage was significantly greater for those in the exposure plus external distraction condition at all time points, excluding the first exposure trial of session one. With regard to the focusing conditions, results indicated that both the focused (internal) group, and the focused (external) group, rates of fear reduction were not significantly different, offering support to the findings of earlier distraction studies highlighting a beneficial distraction effect. These improvements also generalised to the BAT where participants undergoing

externally-focussed distraction during exposure were able to complete more items on the exposure hierarchy, both at post-treatment and at the four-week follow-up, suggesting that the use of distraction may increase the likelihood of approach behaviour (Oliver & Page, 2008). The distraction advantage did not hold true, however, long term at the follow-up sessions, where both distracting and focusing conditions displayed an equal reduction in fear over time. No physiological measure of anxiety was included in this study, which precludes comparison with self-report and BAT measures.

Whilst the Oliver and Page (2008) study offers further support for the beneficial effects of distraction on anxiety reduction both within- and between- exposure sessions, the researchers acknowledged some limitations. Short exposure durations, the use of a sub-clinical sample and, most importantly, the lack of an operationalised (i.e., quantifiable) distracter, limit the replicability and generalisability of the findings.

Johnstone and Page (2004) set out to replicate and extend upon Penfold and Page (1999) and Oliver and Page's (2003) findings with a sample of spider phobics, to assess whether the distraction advantage was generalisable to this client population. Spider phobics (as opposed to spider-fearful individuals) were selected, as it was unclear whether the beneficial effects of distraction observed in the Penfold and Page (1999) and Oliver and Page (2003, 2008) studies, would generalise to a client population with a greater level of fear. In addition, it has been argued that blood-injury phobia does not represent a typical specific phobia, in that it is complicated by vasovagal syncope (Olatunji, Connolly, & David, 2008), and feelings of disgust (de Jong & Peters, 2007;

Sawchuk, Lohr, Westendorf, Meunier, & Tolin, 2002) which may contaminate distraction findings. Johnstone and Page also acknowledge that spider phobia is particularly cohesive with regard to the strength of the associated elements compared to other phobias (Watts, 1990), which should theoretically result in less desynchrony between the response systems.

Johnstone and Page (2004) also improved upon these earlier studies by including a more sensitive test of behavioural avoidance (BAT), and incorporating other physiological measures in addition to heart rate (i.e., skin conductance and blood pressure). Spider phobic participants engaged in either stimulus- relevant (focusing) or stimulus-irrelevant (distracting) conversation while undergoing exposure. Participants underwent three 10-minute exposures and four BATs over a 90-minute period. Participants then attended a follow-up session four weeks later, where they underwent one further 10-minute exposure session and two further BATs.

Both groups (focusing and distraction) experienced an equal level of physiological activation, necessary for “effective” exposure to take place via modification of the fear network. All participants, regardless of experimental condition, experienced significant reductions in SUD ratings both within- and between-sessions: a finding at odds with the common belief that distraction impedes between-session anxiety reduction. Results also indicated that participants undergoing distracted exposure showed greater fear reduction both within and between sessions than those participants undergoing focused exposure. The fact that the distraction advantage in SUD ratings was maintained at follow-up

implies successful emotional processing, as the original fearful reaction was not revoked. In addition, and according to Foa and Kozak's (1986) model, this maintenance of anxiety reduction longer-term is indicative that accumulated corrected information has modified participants' attitudes and beliefs about spider-related threat (Johnstone & Page, 2004). The distraction advantage also generalised to the BAT, where participants undergoing distracted exposure completed a significantly greater number of steps, than the focusing condition, and also experienced a more rapid increase in the achievement of these steps. This was the first study of its kind to demonstrate significant differences on a behavioural measure between distracted and focused groups. Distracted participants also demonstrated significantly larger decreases in Fear of Spiders Questionnaire (FSQ) scores from pre- to post- treatment than focused participants.

Possibly the most interesting (and relevant) finding with regard to the current research program was the finding that only those participants with low initial stimulus-bound anxiety (based on the first BAT performance) experienced reductions in SUD rating while undergoing focussed exposure. This finding is consistent with the Penfold and Page (1999) study that found that participants with high stimulus-bound anxiety benefitted most from distracted exposure. The Johnstone and Page (2004) study coupled with that of Penfold and Page (1999) are the first to provide data suggesting an interaction between anxiety level and distraction, whereby distraction facilitates anxiety reduction optimally when participants' stimulus-bound anxiety level is high, but focusing facilitates anxiety reduction optimally when participants' stimulus-bound anxiety is low. Johnstone and Page (2004) recommend that this interaction be

empirically investigated further to understand more about the parameters of the distraction advantage. Johnstone and Page's (2004) study was unable to further explore this observed interaction, as they did not quantify the extent to which attentional resources were allocated to the distracter or the feared stimuli, respectively.

Using a consistent procedure to manipulate attention, the Page studies found the same beneficial effect of distraction during exposure and, hence, represent the first series of successful replications within the distraction literature. By introducing manipulation checks to ascertain the direction of attention, incorporating large sample sizes, and using the same participant populations (aside from Johnstone & Page, 2004), a high level of methodological rigour was upheld. Johnstone and Page conducted a series of studies in addition to their 2004 study that offer possibly the most promising empirical support for the use of distraction during exposure to date. Before outlining these studies, however, it is necessary to review literature related to attention, and variables that impact on attentional focus, utilising working memory as a means of conceptualising distraction tasks, and also to discuss continuous performance tasks (CPTs), which were successfully used in Johnstone and Page's subsequent studies, as a means of operationalising distraction.

### **Operationalising Distraction: Factors to Consider**

Large variation exists within the distraction literature with regard to several variables including the severity of stimulus-bound anxiety (i.e., fearful versus clinical sample), diagnosis (i.e., type of anxiety investigated), number and duration of treatment

sessions, timing of fear measurement (e.g., during exposure, post-exposure, follow-up several weeks later, etc.), and how changes in anxiety are measured (i.e., self report, questionnaire, behavioural avoidance, etc.). These variables represent some of the possible reasons for inconsistencies in the distraction literature (Antony & Barlow, 2002).

Most importantly, however, studies vary with respect to how distraction is defined and, therefore, implemented. Craske and Barlow (2008) suggest that lack of an operational definition of distraction, in conjunction with the unknown and immeasurable level of distraction, may go some way to explaining the variation in findings. Rodriguez and Craske (1993) add that it is difficult transforming theory into experimentation, as no uniform operational definition of distraction exists. This has led to unnecessary variation in the types of distracters used, adding to the difficulty of objective comparisons between studies. Some studies use visual forms of distraction (where the participants' ability to focus visually on the feared stimuli is interrupted), whereas other studies use cognitive forms of distraction, where the participants' ability to focus *visually* on the feared stimuli is not interrupted but their ability to *think* about the feared stimuli is. Not only does there exist variation *within* visual and cognitive forms of distraction, but also attempts to draw comparisons *between* visual and cognitive forms of distraction only serves to increase the variation in findings. A summary of the various distracters used in the exposure research can be found in Table 1.2. Further, Kamphuis and Telch (2000) identified that many studies failed to use distraction tasks that were “distracting” enough, failed to assess the level of participant engagement in

the distraction task, and failed to assess the maintenance and generalisation of the reductions in fear. Mohlman and Zinberg (2000) add that the overreliance on self report measures of attention and fear, coupled with the lack of objective observers, further complicate research findings. Rodriguez and Craske (1993) suggest that differences in the affective quality of the distracter may be partly responsible, implying that some distracters may be more emotionally provocative than others. Until researchers invest time in overcoming some of the ambiguity in the above-mentioned variables, it will be difficult to understand exactly how distraction impacts on the treatment of anxiety. This is particularly true when researchers do not include objective measures of attention to the feared stimulus.



Table 1.2. *Various Distracters used to date, in Exposure-Based Research*

Authors (Year)	Distraction Method
Grayson et al. (1982, 1986)	Playing video games
Craske et al. (1989)	Diverting attention from somatic cues to external environment
Craske et al. (1991)	Listening for and responding to target words
Rodriguez & Craske (1995)	Watching slides located near feared-stimulus
Haw & Dickerson (1998)	Presented word or dot around feared stimulus
Mohlman & Zinbarg (2000)	Describing physical features of a plant
Kamphuis & Telch (2000)	Identifying target numbers and basic addition
Antony et al. (2001)	Listening to educational information about world geography
Penfold & Page (1999) Oliver & Page (2003) Johnstone & Page (2004)	Stimulus irrelevant conversation (neutral topics)
Telch et al. (2004)	Seashore Rhythm Test (identifying matching auditory tone pattern pairs)
Schmid-Leuz et al. (2007)	Playing puzzle games
Oliver & Page (2008)	Diverting attention toward neutral somatic cues (internal distraction) or toward neutral topics (external distraction)
Johnstone & Page (2007b)	Fruit-relevant conversation (operationalised)
Johnstone & Page (2007c)	Counting backwards by ones or threes (operationalised)

### **Anxiety, instruction, and attentional direction.**

Several factors impact on how attention is allocated during exposure to a feared stimulus. The purpose of this discussion is not to provide an exhaustive review of the myriad of factors that influence attentional allocation, but to highlight some of the more relevant variables that interact within an exposure setting.

The inherent nature of the distracter task selected for use during exposure can influence how attention is captured and sustained in a number of ways. For instance, if a task requires active participation from a participant (e.g. playing a video game), attention is more likely to be captured and sustained, than if a task requires only passive participation (such as watching someone else play a video game; Dahlquist et al., 2007). In addition, if a task requires participants to shift their focus to and from the task, attention will not be stable over time, irrespective of how demanding the task is (Riccio, Reynolds, Lowe, & Moore, 2002). Conversely, participants who have been instructed (or strongly encouraged) to complete a particular task are more likely to maintain their attention towards it (Levy & Pashler, 2001; Pashler, 2000). The affective quality of stimuli (i.e., the extent to which they are emotion-provoking) has also been shown to influence the direction of attention in that aversive stimuli more effectively capture and sustain an individual's attention (Dreisbach & Goschke, 2004; Frischen, Eastwood, & Smilek, 2008; Srinivasan & Gupta, 2010). This influence is possibly due to the evolutionary significance of aversive information with regard to survival (Srinivasan & Gupta, 2010).

Anxiety strongly orients an individual's attention and reduces one's ability to process peripheral (non-threatening) information (Eysenck, 1997; Mogg & Bradley, 2006). Further, Baddeley (2007) refers to the "attention narrowing hypothesis" (p. 260) which involves the narrowing of the focus of attention under high arousal states. For this reason, it cannot be known with certainty how much attention will be diverted to the distraction task when a person is in the presence of a feared stimulus. Due to the strength of anxiety's orienting response, it is unlikely that the distraction task (no matter how demanding) will be processed at the expense of the feared stimulus (Lang, Davis, & Öhman, 2000). For instance, Öhman, Flykt and Esteves (2001) proposed that, due to the operation of evolutionarily shaped cognitive mechanisms, individuals' attention is automatically captured by fear-relevant stimuli, and that such mechanisms play a critical role in facilitating defensive action to deal with the feared object or situation. They further proposed that attentional biases should be primarily evident for biologically salient stimuli, such as snakes or spiders. In addition, the orienting response is believed to be stronger in individuals with higher levels of stimulus-bound fear and this has been demonstrated with various anxious populations (Wilson & MacLeod, 2003). Therefore, it is important to take into consideration an individual's level of stimulus-bound anxiety, the intensity of the exposure and how demanding the distracter is. Despite this extensive variation in the factors that impact attentional allocation, it is not often acknowledged by individual studies how these changes may impact on theory and practice.

### **Working memory as a framework to operationalise distraction.**

In order to overcome some of the variations in the distraction literature, and further establish the boundary conditions of distraction, it is necessary to examine working memory. Working memory plays an essential role in complex cognition, and is regarded within cognitive psychology as the system or mechanism underlying the maintenance of task-relevant information during the performance of a cognitive task (Daneman & Carpenter, 1980; Shah & Miyake, 1999). Baddeley and Logie (1999) regard working memory as the moment-to-moment monitoring, processing, and maintenance of information in both laboratory tasks and everyday settings. Despite the slight variation in definitions (and the vastly different working memory models in existence), most experts agree that working memory represents a conscious, capacity-limited working space where information is temporarily stored, rehearsed, manoeuvred and combined with existing information from long-term memory (Baddeley, 2007). As working memory is likely to play a crucial role in the exposure process with regard to the processing of information, it offers possibly the most appropriate model to conceptualise and quantify distraction and shed light on how distraction impacts on the processing of information in the exposure context.

Within the context of the working memory system and attentional considerations, distraction can be quantified (or operationalised) in terms of how heavily it loads on the limited working-memory system. An integral part of the phobic experience is fear-saturated thoughts (i.e., meaning propositions of the fear network) entering the mind of the phobic individual during the exposure process (Arntz, Lavy, van den Berg, & van

Rijsoort, 1993; Foa & Kozak, 1986, 1998). These thoughts are often concerned with being unsafe or wanting to escape, and place further demand on the capacity-limited working memory system. With regard to the use of distraction during exposure, the limited nature of working memory may represent an advantage rather than a disadvantage, as previously hypothesised in the distraction literature. Specifically, it is thought that rehearsal of fear-saturated thoughts (such as, “I’m unsafe, this is unbearable, I need to escape”) will be more difficult to generate and attend to, when the individual is required to pay attention to the distracting task. Within the context of the emotional processing model, it can be conceptualised as the individual having limited conscious access to (and, therefore, limited rehearsal of) meaning information during exposure, which could potentially go some way to accounting for the distraction advantage.

In terms of understanding how emotional processing and subsequent fear reduction can be enhanced under distracted conditions, Cowan’s (1995, 1999) embedded process model of working memory provides a framework. According to this model, working memory information comes from “hierarchically arranged faculties” (p. 62) including long-term memory, the subset of long-term memory that is currently activated, and the specific component within the currently activated subset that is the focus of attention and awareness (Cowan, 1999). When applying the embedded processes model to the exposure context, it is proposed (contrary to the emotional processing model) that during exposure, information does not need to be attended to in order to create and maintain the activation of fear and, in this sense, information in an individual’s present

focus of attention is only ever a small part of all of the information activated at that time. This model assists in the understanding of how an individual's attention can be largely dedicated to focusing on a distraction task (focus of attention), whilst still attending to and processing information about the feared stimuli (activated subset of long-term memory; Johnstone & Page, 2007c). Cowan (1999) adds that, at the very least, the information in the focus of attention, and possibly all of the activated subset of long-term memory, can result in new links between concurrent activated elements, forming new structures in long-term memory. When reconceptualised within the context of working memory, it becomes clear how a fear network in long-term memory can accommodate new "corrective" information and reduce its cohesiveness under distracted conditions.

The emotional processing model predicts that distraction imposes a heavy load on working memory, essentially blocking stimulus-relevant information from integrating into the fear structure, hence, slowing anxiety reduction in the exposure context. This hypothesis, however, disregards the longstanding literature pertaining to anxiety's ability to orient attention toward the feared stimulus (Eysenck, 1997; Öhman et al., 2001). Given this strong orienting effect, it is difficult to establish quantitatively just how much attention is being paid to the feared stimulus versus the distracter at any given time. Regardless of the difficulty in establishing the exact amount of attention being oriented towards the phobic stimulus, it is important for all individuals undergoing distracted exposure to have enough attention directed toward the phobic stimulus, in

order for fear activation to occur (evidenced in physiological activation from baseline measures).

The complexity of the working memory and attentional systems represents a difficulty in attempting to adequately and accurately quantify the load at any given time. In order to utilise these systems of explanation to operationalise distraction tasks, a reliable and valid method is required, and continuous performance tasks provide a means by which to do this.

***CPT as a test of working memory.***

Continuous performance tasks (CPTs) have been recognised as the most widely used index of attention in both research and practice over the best part of fifty years (Elvevåg, Weinberger, Suter, & Goldberg, 2000; Riccio et al., 2002). They have predominantly been used to measure and obtain quantitative information about an individual's ability to sustain attention over time (Elvevåg et al., 2000; Riccio et al., 2002). CPTs involve having a series of continually changing stimuli (such as pairs of letters or numbers) displayed on a screen, where the participant must identify as quickly as possible an infrequently presented target stimulus. Further, CPTs that require participants to shift their focus of attention from one target to the next target (e.g., when letter pairs are displayed on a computer screen) are known to impose a higher, but more stable, load on working memory (Riccio et al., 2002). CPTs also provide a way of comparing different distraction tasks to see how heavily they load on working memory and how they impact on attention (Denney, Rapport, & Chung, 2005). Data collected

from these tasks can shed light on participants' reaction times (the speed of response), hit rates and error rates (the accuracy of responses), thereby providing useful information as to how distracting a task is. For instance, if participants were required to engage in a counting task whilst undergoing the CPT, their performance could be evaluated and compared to their performance when completing a more difficult counting task. Limited studies exist that have used CPT data to operationalise distraction tasks for use in exposure therapy. Johnstone and Page (2007a, 2007b, 2007c) represent the one exception. As will be discussed in more detail later in this review, they operationalised conversation tasks and counting tasks to serve as the means of distraction in their studies, in order to have a clearer estimate of the level of sustained attention and working memory demanded by these tasks.

***Studies that have used working memory to operationalise distraction.***

Prior to the work of Johnstone and Page (2007a, 2007b, 2007c), that will form the bulk of the discussion with regard to the use of working memory as means of operationalising distraction, there have been only two other studies to attempt to do this (Haw & Dickerson, 1998; Kamphuis & Telch, 2000).

Haw and Dickerson (1998) designed their distraction tasks taking into consideration Baddeley's (1993) multiple component model of working memory. Each task was selected based on which component of the model it was theorised to place demand on. For instance, the condition where participants were required to read words aloud was hypothesised to place demand on the phonological loop. The task that



required participants to visually track an object was hypothesised to place demand on the visuospatial sketchpad, while combining both tasks was hypothesised to place demand on both components of working memory. While this was the first of the distraction studies that attempted to use working memory to operationalise distraction, it was done with limited success, due to the lack of attentional checks used throughout the exposure treatment and, more generally, the lack of independent tests determining whether the distraction tasks were placing demand on the working memory components as hypothesised.

Kamphuis and Telch (2000) also set out to ensure that their distraction task sufficiently taxed participants' ability to process information. They employed a dual task cognitive load that attempted to successfully engage the 'central executive' (a flexible supervisory system responsible for the control of cognitive processes; Baddeley, 2007) to reduce the opportunity for inferential processing. Participants were asked to identify patterns of numbers and respond to a random auditory tone where they were required to perform basic addition and report the answer aloud. Performance on this dual-task was used to determine independently how heavily the mathematical task loaded on working memory. Participants' hits and misses in detecting particular number strings and basic additions were used to assess adherence to the task.

In an attempt to operationalise distraction and overcome methodological flaws in existing distraction research, Johnstone and Page conducted a series of further studies with the aim of quantifying working memory load and attentional allocation demanded

by the distracter. Using the model of working memory, a CPT was developed that participants would be able to complete whilst undergoing either personally-relevant conversation (as used in Johnstone and Page, 2004) or a conversation that should theoretically load more heavily on working memory, due to the continuous recall and organisation from long-term memory it required (fruit-related conversation; Johnstone & Page, 2007a)<sup>2</sup>. In keeping with the 2004 study, Johnstone and Page selected conversation as the distracter, rather than a completely novel task, to minimise the difference between methodologies and subsequent treatment approaches.

Johnstone and Page (2007a) aimed to demonstrate that the distraction tasks used in the 2004 study did indeed load on working memory and attention. Without empirically establishing how much working memory load and associated attention was demanded by these tasks, it could be argued that the distraction condition demanded no more attention than that of the focusing (stimulus-relevant conversation) or exposure alone. In addition, the authors wished to determine whether both conversation tasks loaded more heavily on verbal working memory rather than visual working memory. The conversation-distracters were conceptualised as being cognitively distracting, as opposed to visually distracting, so that participants could remain visually focused on the feared stimulus. The study also aimed to differentiate between the hypothesised low-load distracter (personally relevant conversation) and the hypothesised high-load

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<sup>2</sup> Pilot tests were conducted using the CPT task while participants underwent low-load (personally relevant conversation) versus high-load (fruit-related conversation) distraction which were deemed to load differently on working memory.

distracter (fruit-related conversation), in terms of the working memory load and associated attention.

The format of the CPT task involved the presentation of letter pairs that, depending on the experimental manipulation, were designed to load more heavily on either verbal or visual working memory, in keeping with Baddeley and Logie's (1999) distinction. Each participant underwent both the visual and verbal CPTs under three conditions: personally-relevant conversation, fruit-relevant conversation, and no conversation. Both versions of the CPT involved the presentation of a series of letter pairs over a four-minute period. The visual CPT required participants to respond to letter pairs where both letters were symmetrical (i.e., AO). The verbal CPT required participants to respond to letter pairs where both letters rhyme with the word "me" (i.e., CD). Participants' hit rate (proportion of total targets participants correctly responded to), reaction time to correct targets, false alarm rate and (proportion of non-targets participants incorrectly responded to) were recorded by the CPT program and used to determine how heavily a task loaded on working memory, as participants would have to rehearse the target criteria throughout the task to ensure they could make an accurate decision about which targets to respond to. Attention must be sustained in order to make decisions about responding. Further attention is demanded by participants having to determine whether the first letter meets target criterion before then switching to the second letter.

As predicted, results indicated that performance on visual and verbal CPTs was poorer (evidenced by lower hit rates and slower reaction times) during both (fruit and personally relevant) conversation tasks than during the no conversation task (Johnstone & Page, 2007a). This finding, when considered in the context of Johnstone and Page's 2004 study, indicates that the "distraction" condition (i.e., personally relevant conversation) used in that study was indeed a distraction and demanded significantly more working memory and attentional resources than exposure alone would have. More broadly, this finding also suggests that anxiety reduction can indeed occur under distracted conditions. Also, as predicted, both conversation tasks impacted verbal CPT performance more than visual CPT performance, as evidenced by slower reaction times and lower hit rates on the verbal CPT. Johnstone and Page (2007a) theorised that conversation tasks would interfere with the participants' verbal rehearsal of beliefs about spiders that form a common feature of the phobic experience (Arntz et al., 1993) and this finding offers support for this. Finally, as predicted, the fruit conversation was found to result in poorer CPT performance during both visual and verbal versions of the CPT, as evidenced by participants in the fruit conversation condition having slower reaction times and lower hit rates when compared to the personally-relevant conversation task. This result confirmed the higher level of distraction created by the fruit conversation task that Johnstone and Page would utilise in their subsequent study to establish whether distraction still held its beneficial effect, as compared to focusing.

Johnstone and Page (2007b) aimed to further investigate the observed interaction between fear level and distraction, seen in their 2004 study. Specifically, they wished to

determine whether the distraction advantage would still hold when a high-load distracter was used, instead of the lower-load distracter in the 2004 study. Participants recruited for the study all met criteria for specific phobia (animal type) and were randomly allocated to either the distraction condition (who underwent distraction whilst engaging in fruit-related conversation) or the focused condition (who engaged in stimulus-relevant conversation during exposure). Participants attended one treatment session where they underwent two live exposure sessions and three BATs (pre-treatment, mid-treatment, and post-treatment). The physiological, self-report, and behavioural measures were identical to those used in the 2004 study. All participants experienced physiological activation on measures of heart rate, systolic and diastolic blood pressure, indicating adequate activation of the fear network, irrespective of experimental condition. Both groups experienced both within- and between-session fear reduction, as evidenced by significant reductions in SUD and physiological measures, and significant increases in BAT steps, indicating that treatment was effective. Unlike the 2004 study, however, there was no significant difference in the *rate* of this reduction between conditions. Upon further investigation, it was found that participants in the 2004 study, had significantly higher anxiety than participants in the more recent study which may account for this finding.

Using a median split procedure, Johnstone and Page (2007b) divided participants into low-stimulus bound anxiety versus high-stimulus bound anxiety condition based on their initial SUD ratings during the first few seconds of the first exposure session. When participants were compared in this way, results from SUD data indicated that

participants with lower stimulus-bound anxiety experienced more rapid fear reduction when undergoing focused exposure, than when undergoing distracted exposure. In contrast, participants with higher stimulus-bound anxiety experienced more rapid fear reduction when undergoing distracted exposure than when undergoing focused exposure. The interaction between anxiety level and distraction seen in this study is consistent with the findings of Johnstone and Page's 2004 study. In both studies, high anxiety participants experienced relatively more fear reduction in distraction conditions, whilst low anxiety participants experienced relatively more fear reduction in focusing conditions.

Since the interaction between fear level and distraction load had been established by their earlier studies, in their final study Johnstone and Page (2007c) aimed to investigate this interaction further and determine whether those with high stimulus-bound anxiety would benefit most from high levels of distraction, and those with low stimulus-bound anxiety would benefit from lower levels of distraction. In order to do this, a new distraction task was operationalised using the same CPT program as the previous studies. This new task involved participants counting backwards by threes throughout exposure (high-load distraction condition), or counting backwards by ones throughout exposure (low-load distraction condition). These distraction tasks were determined to differ significantly with regard to how much they loaded on working memory (as evidenced by significantly different hit rates and reaction times), using the same procedure that was used in Johnstone and Page (2007a). The tasks were also deemed to load on verbal working memory, as opposed to visual working memory, and

were therefore determined to be cognitively, rather than visually, distracting. The high-load and low-load counting tasks were also deemed to be equal, in terms of distractibility, to the fruit-related conversation and personally-relevant conversations (respectively), used in the previous studies, making findings comparable across studies.

The selection of a counting task, as opposed to another conversation task, to serve as the distraction was to remove the possible confounds inherent in conversation aiding in building rapport with the therapist, which could influence treatment effects. It was also aimed at increasing the reliability and generalisability of the findings. In addition, selecting a distracter that was more easily monitored (i.e., by checking counting error) ensures, as much as is possible, the level of attentional allocation for both individual participants and experimental conditions at large.

Participants underwent the same procedure as that used in Johnstone and Page (2004), participating in four 10-minute exposure sessions, interspersed with five BATs in the initial treatment session, followed by one further 10-minute exposure session and two BATs at the follow-up session six weeks later<sup>3</sup>. Results indicated that participants with high levels of anxiety at pre-treatment experienced greater reduction in SUD when they underwent high-load distraction during exposure, than when they underwent low-load distraction. This result supports the finding that it takes more distraction to limit the conscious rehearsal of fear-saturated meaning information to a level that optimises

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<sup>3</sup> Follow-up period for Johnstone and Page (2007c) occurred 6 weeks after the initial exposure session, compared to the Johnstone and Page (2004) study, where it took place 4 weeks after the initial treatment session.

dissociation in the fear network. Those participants with high pre-treatment anxiety undergoing a lower-load distraction during exposure were seen to benefit least, due to their level of distraction possibly being too low to shift the focus of attention from fear-saturated meaning information. These findings are consistent with results from Johnstone and Page's previous studies (2004, 2007b). The study also found that participants with low levels of anxiety at pre-treatment benefitted equally from both high- and low-load distracters. This finding was unexpected but makes sense, given the relatively lower anxiety sample used in this study compared with Johnstone and Page's (2004, 2007b) other studies. Johnstone and Page accounted for this finding by proposing that the lack of difference in impact between high- and low-load distracters on participants with lower anxiety was likely the result of fear remaining high enough to maintain underlying activation of the fear structure, irrespective of the high-load distracter. They added that it would not be unreasonable to expect that, as anxiety continued to decrease, the low-load distraction would hold relatively more benefit, as the high-load distracter would likely be too high and inhibit activation of the fear network and result in a slower rate of anxiety reduction.

Johnstone and Page (2007c) provided significant evidence that limiting the rehearsal of catastrophic cognitions (i.e., meaning elements), while the rest of the fear network is activated, encourages faster dissociation between elements of the fear network, which is evidenced by greater and more rapid fear reduction. With regard to Cowan's (1995, 1999) embedded processes model, Johnstone and Page (2007c) acknowledged that information that is activated within the focus of attention can be



more readily modified, and therefore, suggested that this limitation of meaning-element rehearsal should be partial, so that some focus of attention is still able to attend to these meaning elements. These studies offer support to the notion that distraction limits the rehearsal of fear-saturated meaning information during exposure, and in doing so, increases the rate at which anxiety decreases as, in fact, *more* not *less* corrective information can integrate into the fear network.

Johnstone and Page (2004, 2007a, 2007b, 2007c), in their contribution to the distraction literature, undoubtedly provided further clarification about the interaction between fear level and distraction load, and more broadly, about the use of distraction during exposure. Having said this, they acknowledged that further studies exploring the interaction of fear level and distraction load are needed, not only to assist in the rethinking of theoretical models that attempt to account for fear reduction, but also to ascertain when high- versus low-load distractions are beneficial during the exposure process and, specifically, for which anxious populations (i.e., fearful versus clinical samples).

***Summary of the interaction between fear level and distraction load.***

Fear level and distraction load are hypothesised to interact because they are competing forces in determining where an individual's attention is allocated: fear orients attention toward the feared stimuli, whereas distraction draws attention away from it (Johnstone & Page, 2007c). McNally (2007), in his recent review of the literature examining the mechanisms of exposure therapy, suggests that beneficial effects of

distraction might be best explained when looking at how fear level and distraction interact. He suggests that if fear level is too high for optimal emotional processing to occur, then distraction may well reduce the fear level enough for effective processing to occur (McNally, 2007). Supporting this notion are the findings by Penfold and Page (1999) on the use of distraction with blood injury phobics. Results demonstrated that the within-session treatment advantage of distraction was greater for those individuals with higher levels of stimulus-bound anxiety. Similarly, Johnstone and Page (2004) found that spider phobics with a clinical level of fear experienced more rapid fear reduction than those with lower levels of anxiety. Further, those with clinical fear levels who underwent focused exposure had no reduction in fear across sessions, whereas those with lower levels of anxiety who experienced rapid fear reduction.

It is thought that high levels of fear are indicative of highly cohesive fear structures and are, therefore, easier to activate than less cohesive fear structures. Given this, and as outlined above, Johnstone and Page (2007b) further investigated the fear level/distraction interaction and found that distraction advantage is strongest in participants with high stimulus-bound anxiety, while participants with low stimulus-bound anxiety, benefitted most from focusing conditions. The results of their final study (Johnstone & Page, 2007c), where an operationalised counting task was used as distraction, reinforced earlier findings, indicating that the extent to which individuals benefitted from distraction during exposure was contingent upon the level of their anxiety related to the stimulus. Individuals with high levels of fear benefitted from high

levels of distraction and those with low levels of fear benefitted most from low levels of distraction.

From a review of these studies, it appears that the delicate balance between fear level and distraction load determines how much attention is directed toward the feared stimulus which then, in turn, determines how much fear is reduced. When this balance is taken into consideration, it becomes evident that it may be a contributing factor to the great variation in findings across distraction studies. These findings that highlight an interaction between fear level and distraction load are consistent with the general trend in the literature that has found detrimental effects of distraction for individuals with lower levels of fear (e.g. Mohlman & Zinbarg, 2000), but beneficial effects for individuals with phobic levels of fear (e.g. Craske et al., 1991). The activation of fear must be considered in understanding this interaction, because if fear levels are too low and distraction is used, then fear (and its associated network structure) will not be activated and will impact detrimentally on fear reduction. This interaction is in keeping with the proposed mechanisms outlined by the emotional processing model. However, being able to predict how this interaction plays out when fear *is* activated, is a lot more difficult and must be further investigated.

Cowan's (1995, 1999) embedded process model can be further discussed with respect to the framework it offers to theoretically account for the observed interaction between fear level and distraction load. This model proposes that too much distraction, for example, when a low-anxiety participant undergoes high-load distraction, will

reduce the relative benefit of distraction, as at least *some* focus of attention is required for modification of the fear network. In other words, if too much attention is absorbed by the distracter, not enough corrective stimulus-relevant information can enter into the focus of attention, resulting in a slower reduction in fear. Alternatively, too little distraction, for example, when a high-anxiety participant undergoes low-load distraction, will allow fear-saturated meaning information to dominate the focus of attention to a point that does not allow enough corrective information about the feared stimulus, to integrate into the fear network. Therefore, the optimal distraction advantage occurs when cognitive rehearsal of fear-saturated thoughts is limited, but enough corrective meaning information is still able to access and modify the fear network. Within the parameters of the embedded processes model, fear level and distraction load compete with each other to determine the direction and focus of attentional allocation, as anxiety orients attention toward the phobic stimuli, whereas distraction directs attention away from it.

### **General summary of the distraction literature.**

Irrespective of participant population, early studies examining the effects of distraction on exposure demonstrated a within-session treatment advantage for those participants undergoing distracted, as opposed to focused, exposure. However, this advantage did not generalise to between-sessions fear reduction or fear reduction at follow-up (Craske et al., 1989; Grayson et al., 1982, 1986; Haw & Dickerson, 1998; Kamphuis & Telch, 2000). With regard to animal-*fearful* (as opposed to animal-*phobic*) participants, studies have shown that the use of visual distraction during exposure is

detrimental to fear reduction, when compared to visual focusing (Mohlman & Zinbarg, 2000; Rodriguez & Craske, 1995). However, when cognitive distraction is used with an animal-*phobic* population, distraction proved not to have the same detrimental effect (Antony et al., 2001; Craske et al., 1991).

In an effort to clear up some of the inconsistencies in the literature, the more recently published studies by Penfold and Page (1999), Oliver and Page (2003, 2008), and Johnstone and Page (2004) have measured both within- and between-session reductions in anxiety, utilised a clinically relevant distracter (i.e., stimulus-relevant conversation), and included both visual and cognitive checks of attention, in an effort to evaluate the degree of attention demanded by the distracter. Results from these studies demonstrated beneficial effects of distraction on fear reduction both within- and between-sessions, and at follow-up (excluding the Penfold and Page,(1999), study that did not include a follow-up session). These studies are of particular significance, as they are the first replication and extension studies since the very early work of Grayson et al. (1982) and the subsequent follow-up study in 1986 that was fraught with methodological problems.

### **Understanding Distraction Literature in the Context of Existing Theories**

From the literature reviewed here, it is evident that we are starting to learn more about the boundaries of distraction in terms of when and with whom it might be beneficial, versus when and with whom it might be detrimental. Whilst reviewing the empirical evidence is imperative to our understanding of distraction, what remains

possibly even more important is examining how existing theoretical models of fear reduction attempt to account for these findings. Despite the variability in the distraction studies discussed above, many theoretical models of anxiety predict that distraction should impact negatively on anxiety reduction. Even studies demonstrating short-term beneficial effects of distraction are discounted by some theorists, as the distraction advantage is thought to be due to the limiting of the salience of the feared stimuli during the exposure session. As individuals focus fewer attentional resources on the phobic stimuli, it is argued that stimulus representations about the phobic stimulus are not properly encoded into memory, and therefore, the retrieval of these representations is compromised, due to a poor match with the actual stimuli (Rodriguez & Craske, 1995). The habituation model of fear reduction predicts that when there is a poor match between phobic stimuli and the stimulus representations, habituation is less likely to occur (Watts, 1971). However, Rachman (1998) suggests that distraction techniques may actually increase the efficacy of exposure. He proposes that distraction allows the individual to remain in the feared situation and provides a coping technique that increases feelings of self-control and self-efficacy. From the many theories of fear reduction discussed earlier in this review, Foa and Kozak's (1986) model will be used here as a representative example of the most prominent of the emotional processing models. As mentioned above, this emotional processing model is based on the work of Rachman (1980) and Lang (1977) and is arguably the most influential model of fear reduction to date. For these reasons, it will be discussed further here, with respect to its account of the distraction literature.

Foa and Kozak (1986, 1998) specify that the main requirement for fear reduction to occur is full attention to the feared stimulus throughout exposure and, hence, complete activation of the fear network in memory. They claim that anything other than full attention will impede anxiety reduction. In the context of the emotional processing model, distraction is viewed as fear-irrelevant information which interferes with the availability of incompatible information, hence making it less likely that corrective information is incorporated into the fear network. So, although the feared stimulus is for all intents and purposes accessible and available for the duration of exposure therapy, corrective information about it is not entirely encoded and, based on this premise, the formation of a new memory does not occur. In other words, they propose that distraction interferes with the integration of corrective information (i.e., about the probability of harm), so that a person will not be able to effectively interpret and integrate these corrective messages that come from “sitting with the anxiety” in the presence of the feared stimuli. It is claimed that the detrimental effects of distraction will manifest as less behavioural, subjective and physiological anxiety reduction (Foa & Kozak, 1986, 1998).

Foa and Kozak’s model has dominated the way clinicians have understood the mechanisms of exposure therapy for some time, and has resulted in clinicians generally steering away from its use in therapy. Whilst the emotional processing model has undoubtedly revolutionised our understanding of the mechanisms of change underlying fear reduction, it seems that Foa and Kozak (1986, 1998) are only able to comfortably account for findings that demonstrate a deleterious effect of distraction and have great

difficulty accounting for growing literature that has demonstrated that using distraction during exposure can result in more rapid fear reduction both during the exposure session and at follow-up (Johnstone & Page, 2004; Oliver & Page, 2003). The difficulty in accounting for these recent findings renders the emotional processing model worthy of some scrutiny and, at the very least, a review of their proposed mechanisms in light of the distraction literature.

In a more recent review of their emotional processing model, Foa et al. (2006) discuss the concept of an overactivation of the fear network. They propose that whilst activation of the fear network is imperative for effective emotional processing and subsequent fear reduction, overactivation, leading to an extreme activation of the network, may interfere with emotional processing. This interference is said to be due to failure to incorporate new information into the network, due to inhibited attention, diminished encoding of new information, and biased processing of available information (Foa et al., 2006). If this is indeed the case, it would seem likely, then, that the use of distraction may in fact have a beneficial effect. Distraction could indeed serve to regulate the degree of network activation and potentially result in *increased* encoding and processing of new information. This proposed regulation could go some way to explaining some of the beneficial effects of distraction, observed in recent studies, where distraction load was matched with anxiety level (Johnstone & Page, 2007c).

Foa et al. (2006) attempt to differentiate distraction from decreased attention, in order to account for the research demonstrating beneficial effects of distraction. They



conceptualise distraction, however, as “complete disengagement from threat stimuli” (p. 10) and argue that the studies demonstrating positive effects of distraction do not technically meet this criterion, as the individual maintained visual focus on the stimulus and maintained attentional engagement (Johnstone & Page, 2004; Oliver & Page, 2003, 2008; Penfold & Page, 1999). By this strict definition, simply none of the studies demonstrating beneficial effects could be categorised by Foa and colleagues as being true distraction-based studies. This rigid definition of distraction raises further problems in that if distraction is defined as *complete* disengagement from a threat stimulus, then there can be no exposure either, rendering the concept of distraction during exposure a logical impossibility. Foa et al. (2006) do admit though that questions remain as to why the above-mentioned studies, examining the effects of decreased attention would be beneficial during exposure, as the emotional processing model dictates that anything other than full attention to the feared stimulus should interfere with network activation and encoding of new information.

At present, Foa et al.’s (2006) primary explanation for the inconsistencies in the distraction literature is that studies demonstrating a beneficial effect of distraction differ methodologically from those studies demonstrating deleterious effects, however, they do not clarify the ways in which studies differ, nor how this impacts on the relative benefit/detriment of distraction. Further, they argue that the studies demonstrating benefits of distraction deal exclusively with specific phobias, but they go on to say that no replication studies have been conducted using operationalised distraction with other anxious populations.

In light of these more recent findings demonstrating the benefits of distraction when it is used in exposure therapy, Foa et al. (2006) have stated that it might be possible that the relative benefit/detriment of distraction-use depends on the type of anxiety disorder being treated, suggesting that it might have a more beneficial effect when treating specific phobia. It is proposed that this is due to specific phobia clients having a more coherent fear structure. It is unclear exactly how this conclusion was reached, as no solid explanation for this statement was provided and it therefore remains speculative at best.

Regardless of these proposed explanations by Foa et al. (2006) for the variation in distraction findings, the problem still remains that the emotional processing model cannot fully account for these variations and provides somewhat speculative explanations that do not adequately theoretically account for the findings. The current research program aims to further test the emotional processing model and its perspective on the use of distraction during exposure. The following chapter will outline the rationale for the current research program, the methodological considerations undertaken, and will introduce the first of three studies that the current program of study comprises.

## **Chapter 2**

### **Study 1**

#### **Establishing the Relationship between Distraction Load and Fear Level over Time**

The emotional processing model (Foa & Kozak, 1986, 1998) represents one of the most widely researched models of fear reduction to date. Although it can account for many findings within the distraction literature, it seems to account more comfortably for findings that demonstrate a detrimental effect of distraction, arguing that being distracted prevents the necessary activation of the fear network, so that emotional processing remains incomplete. Despite the lack of studies that empirically investigate the mechanisms of change that underlie fear reduction under distracted conditions, the notion that the use of distraction during exposure is detrimental remains. Further, the lack of agreement about what constitutes distraction, and the subsequent lack of consistency in the distraction research has led to confusion and a lack of unity within the psychological community about its use with various client populations. This has meant that Foa and Kozak's (1986, 1998) emotional processing model (complete with its negative but potentially unsubstantiated views about distraction) has dominated both theory and practice.

Taking into consideration the series of Johnstone and Page (2004, 2007b, 2007c) studies, it is becoming evident that distraction may operate, in fact, by interfering with the amount of working memory capacity available for the rehearsal of fear-relevant

thoughts to be rehearsed and held in conscious awareness. With regard to the emotional processing model, it is proposed that distraction limits conscious access to meaning information during exposure, hence resulting in more rapid fear reduction when compared to focused exposure. A very delicate balance between fear level and distraction load appears to be emerging, and it is starting to become clear how such variation in findings exists within the literature, as to the relative benefit/detriment of distraction use on fear reduction.

Given the paucity of methodologically sound studies investigating distraction during exposure, particularly given the lack of studies with objective checks of attention and operationalised distracters, it is evident that introducing further variations in type of distracter used, phobic population, or measurement of fear is fruitless. In addition, it becomes difficult to determine what variables are responsible for the varied results when each study alters several variables at once. In this sense, the lack of replication studies examining the therapeutic value of distraction has already limited the expansion and consolidation of knowledge. Further, introducing additional variability in the current research program would simply be adding to this problem. What would be a prudent and more meaningful contribution to the distraction literature would be studies that can replicate, build upon, and improve previous existing studies so as to more fully understand the mechanisms of fear reduction, especially under distracted conditions. The present program of study aims to replicate and extend on the existing distraction literature, specifically the Johnstone and Page (2004, 2007b, 2007c) studies, and intends

to investigate further the extent to which distracted exposure can facilitate fear reduction.

### **Methodological Considerations**

Methodological considerations are discussed below with respect to the current research program.

#### **Selection of phobic stimulus.**

The present research program is a replication and extension of Johnstone and Page (2007c), and for this reason spiders were selected as the phobic stimulus, so as to not introduce further, and unnecessary, variation into the distraction literature. Originally, Johnstone and Page (2004) selected spider-phobic individuals, due to the use of blood-injury fearful samples in previous studies, that may have introduced complications due to the vasovagal syncope response inherent in this fear (Olatunji et al., 2008), coupled with feelings of disgust (de Jong & Peters, 2007; Sawchuk et al., 2002). In this sense, spider phobia was considered to be a more easily examinable anxiety in which to assess the effect of distraction. Johnstone and Page also acknowledge that spider phobia (as opposed to other phobias) is particularly cohesive with regard to the strength of the associated elements (Watts, 1990), which should theoretically result in less desynchrony between the response systems. Finally, on a more practical note, Johnstone and Page, noted that spiders are a relatively controllable stimulus to use in a laboratory setting, compared to examining fear of heights, or snakes for instance.

### **Checks of attention.**

As seen in Table 1.1, many studies within the distraction literature do not contain checks of visual or cognitive attention. Of those studies that have included checks of attention, many are insufficient for determining the degree of distractibility (either visually or cognitively). Measures of visual attention to the feared stimuli may be more easily estimated with a self report measure. However, with regard to cognitive distraction, it becomes more difficult to use self report as it assumes the participant has an objective sense of how much time they spent thinking about the feared stimuli. It also assumes that the degree to which an individual is distracted is consciously accessible and able to be reported on. The ambiguity inherent in the lack of objective measures of cognitive attention makes it difficult to objectively ascertain attentional direction and, therefore, difficult to ensure the intended experimental manipulation has successfully taken place.

### **Selecting a suitable distracter.**

Further complicating the matter of ascertaining attentional direction is the choice of distracters used in previous studies. Distracters such as describing the physical features of a plant (Mohlman & Zinbarg, 2000) or playing puzzle games (Schmid-Leuz et al., 2007) cannot ensure the degree of distractibility of these tasks, thereby confounding the subsequent findings. Even studies that have used a therapy-relevant distracter (i.e., conversation; (Johnstone & Page, 2004, 2007b; Oliver & Page, 2003; Penfold & Page, 1999) have not been able to adequately operationalise (or quantify) exactly how distracting these tasks are. Johnstone and Page (2007c) represents the first

study to successfully operationalise a task (using a CPT that loaded on working memory). Not only does this operationalised counting-based distraction task offer more accurate information as to how distracting a task is, but it also offers the opportunity to include objective checks of cognitive attention. For instance, Johnstone and Page (2007c) included a manipulation check to determine any differences in counting ability (and, therefore, distraction level), and the present study has adopted the same objective check of attention<sup>4</sup>. Replication of this counting task and associated attentional checks is warranted to consolidate our knowledge of its validity.

### **Number and duration of exposure sessions.**

The present study sought to improve on the limitations of previous studies with regard to the number and duration of exposure sessions. For example, a limitation of Penfold and Page (1999) was that it focused exclusively on within-session anxiety reduction, having only one exposure session. Replications and extensions of this study (e.g., Johnstone & Page, 2004, 2007b, 2007c; Oliver & Page, 2003, 2008) have since included more than one exposure session, to be able to assess between-session (longer-term) reductions in anxiety under distracted conditions. In addition, previous studies examining the effects of distraction during exposure have been criticised for not having long enough exposure sessions. Rodriguez and Craske (1995) suggested that lengthier exposure durations (than the 15 minute exposure session used in their study) may have led to an increase in fear reduction in low-intensity conditions and allowed more time for heart rate habituation to occur. They recommended that future studies examine the

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<sup>4</sup> Attention check is described in detail under ‘Manipulation checks’ p. 83.

effects of distraction over extended exposure durations. Similarly, Johnstone and Page (2004) found that participants with higher levels of stimulus-bound anxiety did not experience reductions in subjective fear (when undergoing focused exposure) and claimed that if longer exposure durations had been included in their study (i.e., longer than 10 minutes), the distraction advantage observed may not have persisted.

Further, studies that have demonstrated short-term (within-session) beneficial effects under distracted conditions have been discounted by Foa and Kozak within their emotional processing model's framework, as the distraction advantage was proposed to be due to limiting the salience of the feared stimuli during the exposure session. As individuals focus fewer attentional resources on the phobic stimuli, it is argued that stimulus representations about the phobic stimulus are not properly encoded into memory and, therefore, the retrieval of these representations is compromised due to a poor match with the actual stimuli (Rodriguez & Craske, 1995). In this sense, the distraction advantage has traditionally been disregarded as incomplete processing, as opposed to dissociation of the elements within the fear network resultant from effective emotional processing. It is for this reason that longer (20 minute) exposure durations were selected for the current study, with the aim of determining whether the rate of anxiety reduction continues in a similar trend over a longer period of time and, more generally, to further establishing the boundary conditions of distraction. Exposure duration of 20 minutes was chosen as it offers ample time for fear reduction to take place, but not too much time for fear to completely reduce to the point where any group differences in the rate of fear reduction would be undetectable.



With these methodological considerations in place, the present study aims to further explore the boundary conditions of distracted exposure. Specifically, it aims to determine whether the observed interaction from the Johnstone and Page (2004, 2007b, 2007c) studies, in which high stimulus-bound anxiety benefitted more from a high-load cognitive distracter, and a low stimulus-bound anxiety benefitted more from a low-load cognitive distracter, would be replicated with improved methodology. Johnstone and Page (2007c) have provided significant support to suggest that limiting the rehearsal of catastrophic cognitions (i.e., meaning elements), while the rest of the fear network is activated, encourages faster dissociation between elements of the fear network, which is evidenced by greater and more rapid fear reduction. With regard to Cowan's (1995, 1999) embedded processes model, it is proposed that activated information within the focus of attention can be more readily modified and, therefore, this limitation of meaning-element rehearsal should be partial, so that some focus of attention is still able to attend to these meaning elements. The Johnstone and Page studies offer support for the notion that distraction limits the rehearsal of fear-saturated meaning information during exposure and, in doing so, increases the rate at which anxiety decreases, as in fact, *more* not *less* corrective information can integrate into the fear network.

In further investigating the possible interaction between fear level and distraction load, the present study intends to overcome one of the confounds of previous research. Previous distraction studies have categorised participants according to stimulus-bound pre-treatment anxiety level (high versus low anxiety groups; Johnstone & Page, 2004, 2007b, 2007c; Penfold & Page, 1999). Criteria for making this distinction have been

based on performance on a pre-treatment behavioural approach task (Johnstone & Page, 2004; Penfold & Page, 1999), or pre-treatment SUD ratings (Johnstone & Page, 2007b, 2007c). A major problem with this approach is that, during exposure, anxiety levels decrease over time as habituation occurs in the presence of the feared stimuli. So, examining the relationship (or the interaction) between anxiety level (as assessed at pre-treatment) and distraction is complicated by ongoing anxiety reduction throughout exposure. It has been difficult, therefore, to examine the effect of varying levels of distraction with varying levels of fear, as fear levels cannot be kept constant. Also, this previous research investigated the relationship between pre-treatment anxiety level and distraction load, rather than how anxiety reduces under different distraction loads over time. The results of these previous studies, therefore, have difficulty in assisting clinicians with more practical issues related to how to use distraction, when to use it, and for how long. The present study aimed to assess the interaction between fear level and distraction load over time, a method which to the author's knowledge, has not yet been used within the distraction literature.

Based on the findings of Johnstone and Page (2004, 2007b, 2007c), in conjunction with Penfold and Page (1999) and Oliver and Page (2003, 2008), the following predictions were made about a group of spider-fearful individuals undergoing varying distraction loads over two exposure sessions:

### **Hypotheses related to Overall Treatment Effectiveness (All Participants)**

(a) It was hypothesised that all participants, regardless of distraction level over time, would demonstrate both within- and between-session reduction in subjective fear, physiological responding (i.e., heart rate, systolic and diastolic blood pressure), and behavioural avoidance. It was also hypothesised that these treatment gains would be reflected in the Fear of Spiders Questionnaire (FSQ) scores, with participants reporting significantly less spider-related fear on this scale at post-treatment than at pre-treatment.

(b) It was also hypothesised that activation of physiological and subjective anxiety would occur for all groups. Despite Foa and Kozak's (1986, 1998) prediction that activation of the fear network will not occur under distracted conditions, other research disagrees by strongly suggesting that animal fears represent tight-knit fear structures that require little match between the stimulus (spider) and the representation in memory to allow activation (Öhman et al., 2001).<sup>5</sup>

### **Hypotheses related to the Interaction between Fear Level and Distraction Load (Specific to Experimental Condition)**

(c) It was predicted that participants who underwent the high-load (HL) distraction condition in the initial exposure session followed by the low-load (LL) distraction condition in the second exposure session (group 1: HL-LL) would experience the greatest anxiety reduction, as evidenced in subjective, physiological, and behavioural reductions in anxiety, since anxiety would be relatively higher in the first

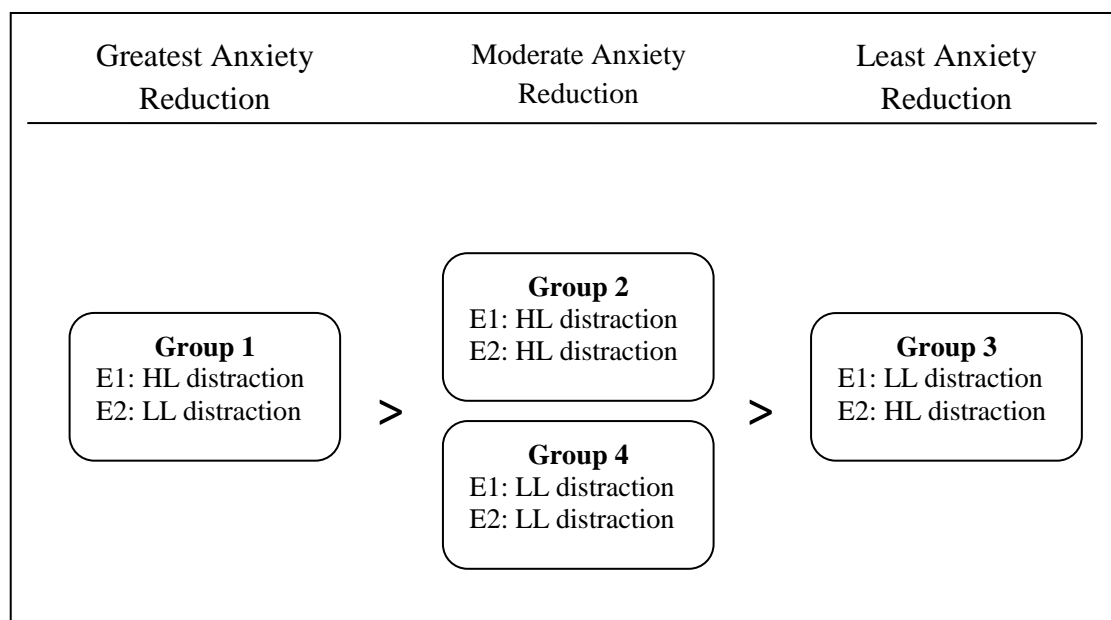
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<sup>5</sup> Also, other studies investigating the effect of distraction during exposure (i.e. Johnstone & Page, 2004, 2007b, 2007c) have demonstrated activation of the fear network from baseline under distracted conditions.

exposure session and relatively lower in the second. Essentially, matching distraction load and anxiety level throughout the treatment process is hypothesised to provide the optimal conditions for fear reduction under distracted conditions, based on the Johnstone and Page (2004, 2007b, 2007c) studies. It was also predicted that group 1 (HH-LL) would demonstrate greater spider-related fear reduction (pre- to post-treatment) on the FSQ than all other groups.

(d) It was predicted that those who underwent the low-distraction condition in the initial exposure session followed by the high-distraction condition (group 3: LL-HL) would experience the least anxiety reduction, since results of previous studies indicate that when anxiety is relatively high, as one would expect it to be in the initial exposure session, participants do not tend to benefit from lower levels of distraction. And, as anxiety levels become lower, as one would expect to occur in the second exposure session, participants do not tend to benefit from higher levels of distraction (Johnstone & Page, 2004; Penfold & Page, 1999).

(e) Finally, it was predicted that groups 2 (HL-HL) and 4 (LL-LL) would result in moderate anxiety reduction, specifically, not greater reduction than group 1 but not less reduction than group 3, as distraction load was optimal in one exposure but not the other for both of these groups. These hypotheses can be seen pictorially below in Figure 2.1.



*Figure 2.1.* Hypothesised performance of experimental groups rated in terms of which will experience greater anxiety reduction.

## Method

### Participants

The sample consisted of 67 participants, recruited from the Murdoch University undergraduate psychology subject pool ( $n=30$ ) and via on-campus advertisements (See Appendix A) and by word of mouth ( $n=37$ ). Subject pool participants were offered credit points for their participation. The remaining participants were recruited on a voluntary basis and were not offered any incentive to participate, other than being offered an opportunity to reduce their spider-related fear<sup>6</sup>. Participants were eligible to

<sup>6</sup> Additional efforts were made (with ethics approval) to recruit participants via a local newspaper (See Appendix B) and by phone interview on a local radio station, however no participants were recruited via these methods.

participate if they responded positively to at least one of the three randomly selected items (see Appendix A) from the Fear of Spiders Questionnaire (FSQ; Szymanski & O'Donohue, 1995), indicating that they had some level of spider-related fear. No participants withdrew from the study at any time and the final sample consisted of 45 females and 22 males. There were 18 participants in condition 1, 16 participants in condition 2, 17 participants in condition 3, and 16 participants in condition 4.

## **Materials**

### **Self-reported fear of spiders.**

#### ***Fear of Spiders Questionnaire (FSQ).***

The FSQ (Szymanski & O'Donohue, 1995) was administered pre-intervention and post-intervention. The self-report questionnaire contains 18 items designed to measure both cognitive and behavioural responsiveness to spiders (See Appendix C). It contains two subscales, namely, avoidance/help seeking and fear of harm (Szymanski & O'Donohue, 1995). Participants were required to rate how typical each statement is of them on a 6-point Likert scale, ranging from strongly disagree (0) to strongly agree (5). Total scores range from 0 to 90, with the higher the total score, the higher the phobic level of the individual. Studies evaluating the FSQ's psychometric properties have demonstrated the measure has excellent split-half reliability, internal consistency and has adequate test-retest coefficients (Muris & Merckelbach, 1996; Szymanski & O'Donohue, 1995). The measure's construct validity is sound, being able to differentiate phobic individuals from non-phobics, as measured by a behavioural approach task, and has an alpha coefficient of 0.92 (Szymanski & O'Donohue, 1995).

The FSQ is capable of assessing low-levels of self-reported spider fear and is relevant, therefore, for use with a non-phobic sample (Muris & Merckelbach, 1996).

***Anxiety Disorders Interview Schedule for DSM-IV (ADIS).***

An adapted version of the specific phobia section of the Anxiety Disorders Interview Schedule for DSM-IV (ADIS) was used to assess whether participants met criteria for specific phobia – animal type (spiders; Brown, DiNardo, & Barlow, 1994). The structured interview was presented to participants in written form and had been adapted only to make the measure specific to spider fears (See Appendix D).

***Subjective Units of Distress Scale (SUDS).***

A simple Subjective Units of Distress Scale (SUDS; Wolpe, 1958) was used throughout the two live-exposure sessions, to measure the participants' subjective levels of distress (or fear), in line with research suggesting that verbal reports of anxiety are definitional and essential (Rachman, 1998). In keeping with Johnstone and Page (2004, 2007b, 2007c) the SUD scale was presented to participants in written form comprising of an 11-point visual analogue scale ranging from 0 (no fear) to 10 (extreme fear; See Appendix E).

**Behavioural measure of fear of spiders.**

The behavioural measure of anxiety used in the present study was a 10-step exposure hierarchy or Behavioural Approach Task (BAT; See Appendix F). The hierarchy consisted of 10 tasks each relating to spiders, starting with the easier items, gradually progressing to the most difficult. Participants were required to attempt the BAT on three occasions during the 90-minute session (pre-intervention, and after each

live exposure session). Participants were provided the following instructions: “You will now complete a behavioural task. If you can, please do each of the tasks instructed. If you can complete an item within 5 seconds, I will place a tick next to it. If you cannot complete the item at all, or take longer than 5 seconds to complete the item, it will be marked with a cross for that item and the remaining harder items. Please tell me when it becomes too fearful and you cannot complete the task required”. A time limit of 5 seconds was applied to BAT items, to increase the sensitivity of the measure. Distraction was not utilised during the BAT tasks. Low scores indicate a higher level of spider avoidance.

### **Physiological measures of fear of spiders.**

Several physiological measures were used as indices of fear reduction in the present study, due to prior distraction research demonstrating an overreliance on heart rate as a primary physiological index of fear reduction (Rodriguez & Craske, 1993). Relying exclusively on heart rate is problematic, due to a myriad of potential confounds, such as physical movement, respiratory activity and body position (Rodriguez & Craske, 1993). It is for this reason that several measures of physiological reactivity were used. Systolic blood pressure (mmHg), diastolic blood pressure (mmHg) and heart rate (pulse/min) were measured at evenly spaced time points at intervals of 3 minutes and 15 seconds (i.e. at 3’ 15”, again at 6’30”, again at 9’45” etc) during the two live-exposures using an Omron Automatic Digital Blood Pressure Monitor (model IA1B). Baseline measures were taken at the very end of the 90-minute session, once all spider-related tasks and questionnaires had been completed. Baseline measures were taken at the end,



rather than the beginning, of the experimental session, so results would not be confounded by anticipatory anxiety.

### **Phobic stimuli.**

The stimulus utilised for both exposure sessions was a live Black House Spider (*Badumna Insignis*) approximately 3 cm in diameter. During exposure sessions, the spider was placed in an open glass dish with approximate dimensions of 29cm (L), 19 cm (W), 5cm (H). The stimulus used for the first step of the BAT was a large colour picture of a Tarantula (*Eurypelma Spinicrus*; See Appendix G). For the second step of the BAT, 45 seconds of tarantula footage was used and was viewed by the participant on a SONIQ portable DVD player (with a screen diameter of 17cm). The stimulus used for the remaining 8 items on the BAT was that of a preserved Tarantula (*Eurypelma Spinicrus*; 12 centimetres in diameter) housed in a clear portable pet container with a removable lid that was set up to mimic the Tarantula's natural environment [Dimensions: 27cm (L), 17 (W), 16(H); See Appendix H]. Participants were informed the tarantula was dead prior to commencing the behavioural task.

### **Experimental manipulation.**

Manipulation of cognitive attention was based on the method used by Johnstone (2007c). Using the concept of working memory load to operationalise distraction, a continuous performance task (CPT) was used. For the high-load distraction task, participants were required to count backwards continuously in threes from 900 at three second intervals for the duration of the exposure session. For the low-load distraction

task, participants were required to count backwards continuously by ones from 900 at three second intervals (See Appendices I and J for high-load and low-load counting task instructions, respectively). To ensure counting frequency was controlled, a beep would sound at 3-second intervals and the participant would then be required to state the next number in sequence. All participants were instructed to try their hardest not to make any mistakes while counting and were told to keep visually focused on the spider at all times throughout the exposure session. Total counting errors were calculated to provide an indication, in as much as is possible, of the level of distraction and to ensure the rate of distraction did not differ within each load across groups.

### **Manipulation checks.**

As was the case with the Johnstone and Page (2007c) study, a manipulation check was used in the present study to determine any differences in counting ability between groups and to determine the success of the experimental manipulation. The literature related to effort allocation was considered with regard to this, as it is likely that the amount of working memory demanded by the task is impacted by differing amounts of effort given to the task by participants (Levy & Pashler, 2001). For this reason, participants were instructed to apply maximum effort to the counting task and to try very hard not to make any mistakes while counting. Participants were informed that their counting would be recorded for the duration of the exposure session, in order to check for errors, and they were aware that should they make mistakes, their data may be useless and they may be asked to complete further testing. Participants' counting was audio-taped (during the two live exposure sessions) and two random 60-second portions

of the recording (one from each live exposure session) were checked for the number of errors. This was to ensure the counting task was taken seriously by participants, thereby reducing the risk of them not being distracted at the intended level. It also provided a means by which to gauge the difficulty of the counting task and, therefore, the associated 'load' attached to the task (i.e., the harder the counting task, the more errors made).

To check participants' visual attention to the spider, a self-report measure was used. Participants were asked to rate the percentage of time they spent looking at the spider for both exposure sessions to ensure there were no group differences.

Spider movement was also assessed and participants were asked to rate the percentage of time the spider was moving for each exposure session. This check was included due to research indicating that increases in perceived spider movement can increase perceived danger, subjective anxiety, and can increase exposure intensity (Riskind, Moore, & Bowley, 1995). This check was also utilised in the Johnstone and Page (2004, 2007b, 2007c) studies. Participants were also asked to rate how similar the spiders used in the experiment were to the spiders they are most afraid of. Participants responded using an 11-point Likert scale, with 0 being 'not at all similar' and 10 being 'exactly the same'. This check was included in keeping with Johnstone and Page (2004, 2007b, 2007c) and because it is known that spider-fearful individuals can have varying responsiveness to different types of spiders (Watts, 1990). See Appendix K for manipulation check document.

## Design

The current study did not include a control group for several reasons. Firstly, the current study did not wish to empirically investigate the effects of distraction versus focusing during exposure therapy, as several studies have already done just this, establishing the distraction advantage (Johnstone & Page, 2004, 2007b, 2007c; Oliver & Page, 2003, 2008; Penfold & Page, 1999). Instead, the current study aimed to build upon existing research by empirically investigating the interaction between anxiety level and distraction load over time, rendering a control group (undergoing no distraction) irrelevant. In addition, a control-group that does not undergo cognitive distraction would be an invalid group with which to compare experimental groups, because of the impossible task of assessing participants' direction of attention (i.e., the extent to which cognitive resources were being allocated to the feared stimulus). In this sense, a control group would not represent an advantageous addition to the study design.

## Procedure

Participants were randomly allocated to one of the four experimental conditions prior to their arrival (see Table. 2.1). Once participants had been briefed on what their participation in the study would involve (See Appendix L), their informed consent was obtained (See Appendix M). Participants were required to complete the pre-intervention FSQ. Prior to this, participants were shown a life-sized picture (See Appendix N) of a Black House Spider (*Budumna Insignis*), which was the spider used for live exposure sessions. Participants were asked to imagine a spider of a similar shape and size when responding to FSQ items, to rule out variations in responses between participants due to

participants imagining different spiders. Participants were also administered the ADIS at pre-intervention to assess whether participants met DSM-IV criteria for specific phobia-animal type (spiders).

*Table 2.1. Four Experimental Groups used in Study 1*

	Exposure 1	Exposure 2
Group 1	High-load (threes)	Low-load (ones)
Group 2	High-load (threes)	High-load (threes)
Group 3	Low-load (ones)	High-load (threes)
Group 4	Low-load (ones)	Low-load (ones)

BAT-1 was then attempted, after which the blood pressure monitor was attached and instructions given for exposure 1. The glass tray containing the spider was placed in front of the participant, 10 centimetres away from the table edge. Participants were instructed that they needed to view the spider directly (not through the glass edge of the tray) and, therefore, needed to be sitting upright with their face approximately 25 centimetres above the phobic stimulus. Participants were instructed to keep visually focused on the spider at all times. Audio taping of the participants' counting commenced at the same time as the exposure and participants either engaged in a high-load or low-load counting task, depending on the condition to which they had been randomly allocated. Blood pressure, heart rate and SUD ratings were collected at evenly spaced intervals of 3 minutes and 15 seconds for the 20-minute exposure session (making a total of seven data-points per 20 minute exposure). At the end of the 20-

minute exposure session, the tray was removed and covered out of sight of the participant and the blood pressure monitor removed. BAT-2 was then attempted, followed by the blood pressure monitor being reattached and instructions read for the second 20-minute live exposure session. BAT-3 was then attempted, followed by the completion of the post-intervention FSQ and self-report manipulation checks. Once all spider-related tasks were complete, participants were encouraged to relax for 5 minutes while baseline heart-rate and blood pressure measures were taken. Finally, participants were offered the opportunity to ask any questions or raise any concerns and a debrief worksheet was provided. Refer to Figure 2.2 for procedure timeline.

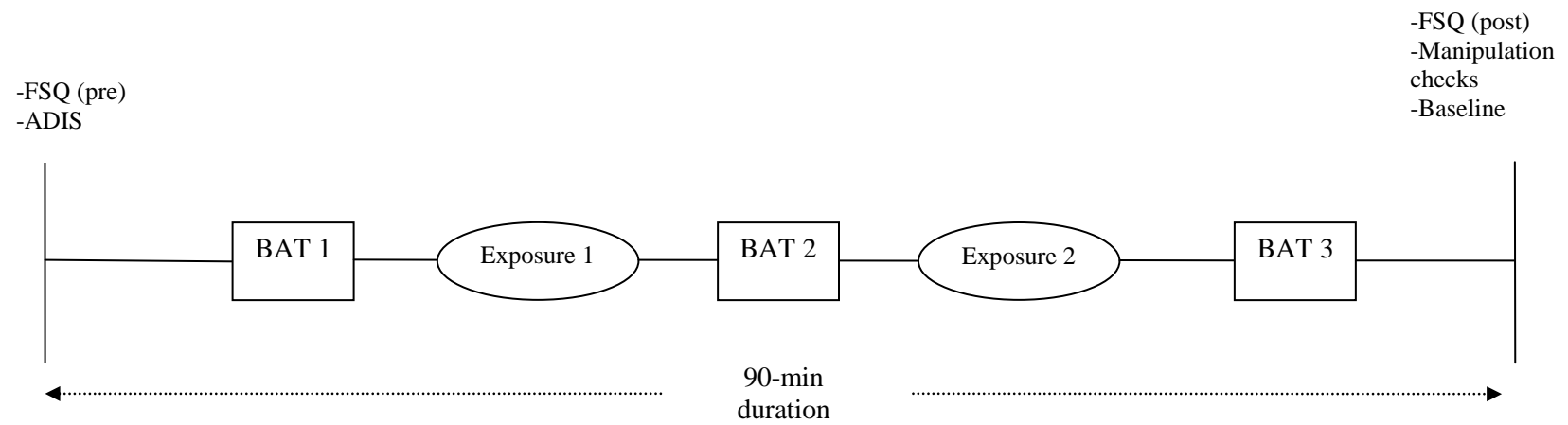


Figure 2.2. Timeline of the experimental procedure, outlining questionnaire administration, BAT, and exposure sequence.

## Results

Data from 67 participants were analysed. Prior to analysis, variables were screened for outliers within each condition ( $|Z| > 2.5$ ). Outlying scores were replaced with the next most extreme score for that distribution (Field, 2005; Tabachnick & Fidell, 1996). Of the 67 participants, four were removed from the sample prior to analysis, because they rated the spiders used in the experiment as “not at all” like the ones they fear. Participants with standardised scores of  $\leq -1.809$  (or raw scores of 0 or 1 out of 10 on the scale) were excluded from the study, as their level of fear was not considered to be typical of, or relevant to, the population of subjects we wished to examine<sup>7</sup>. The final sample used for analysis contained 63 participants. Assumptions of ANOVA were met. Unless otherwise indicated, all  $F$  values (and associated degrees of freedom) reported use the more conservative Greenhouse-Geisser correction, where Mauchley’s test of sphericity had been violated. An alpha level of  $p=.05$  was used to determine statistical significance.

### Manipulation Checks

**Visual focus on stimuli (looking %) and intensity of exposure (spider movement %).**

As indicated in Table 2.2, there were no group differences on self-reported estimates of the percentage of time participants spent looking at the spider during the two exposure sessions,  $F(1, 59) = 2.51$ ,  $p = ns$ ,  $\eta^2 = .11$ . The absence of group

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<sup>7</sup> This screening tool was based on that used by Johnstone and Page (2004) and features as Appendix O.



differences on this measure supports the assumption that high- or low-load distraction tasks do not interfere with the degree of visual attention towards the phobic stimulus.

Table 2.2

*Mean Scores for the Four Experimental Conditions at Pre-treatment and Post-treatment for each of the Manipulation Checks.*

Measure	Condition	Time	
		Exposure-1	Exposure-2
Look (%) <sup>1</sup>	Group 1	95.41 (2.29)	97.24 (2.95)
	Group 2	91.36 (2.52)	89.79 (3.25)
	Group 3	92.82 (2.29)	83.59 (2.95)
	Group 4	96.27 (2.44)	95.67 (3.14)
Move (%) <sup>2</sup>	Group 1	34.41 (6.83)	32.53 (6.53)
	Group 2	28.57 (7.53)	29.57 (7.19)
	Group 3	30.82 (6.83)	34.65 (6.53)
	Group 4	41.33 (7.27)	41.67 (6.95)

*Note:* Values in parenthesis represent the standard error of the mean.

<sup>1</sup> Percentage of time participants reported looking at the spider for each exposure session

<sup>2</sup> Percentage of time participants reported spider movement during each exposure session

There were also no group differences on self-reported estimates of the percentage of time the spider was moving during each of the two live exposure sessions,  $F(3, 59) = .69$ ,  $p = ns$ ,  $\eta^2 = .03$ . The absence of group differences on this measure, supports the assumption that exposure characteristics that influence anxiety reduction (i.e., intensity of exposure) were equivalent between the conditions.

### Counting Errors.

As predicted, a significant difference existed between groups on the average number of counting errors, as evidenced by a main effect of group,  $F(3, 59) = 9.52$ ,  $p <$

.001,  $\eta^2 = .33$ . No significant main effect of time was found when examining participants' average counting-error rate, likely due to the change in experimental manipulation for two of our four experimental groups from exposure 1 to exposure 2,  $F(1, 59) = 3.47, p = ns, \eta^2 = .06$ . Also as predicted, the rate of counting errors over time was different for each group,  $F(3, 59) = 22.62, p < .001, \eta^2 = .54$ . Further analysis regarding the nature of these differences over time and how they relate to distraction load can be found at the end of this section.

### **Dependent Variables Pre-treatment**

There were no group differences on any dependent variable at pre-treatment. Table 2.3 illustrates relevant physiological summary statistics and Table 2.4 shows results from self-reported fear of spiders. There were also no group differences for self-reported ratings of subjective anxiety at pre-treatment,  $F(3, 59) = .75, p = ns, \eta^2 = .04$ , nor were there group differences at pre-treatment for the behavioural approach task (BAT;  $F(3, 59) = .489, p = ns, \eta^2 = .02$ ).

### **Fear Activation**

A prerequisite for the effectiveness of exposure therapy is that fear be activated (Foa & Kozak, 1986). A series of repeated measures ANOVAs were conducted to ensure that activation above baseline occurred for all physiological measures, including heart rate, systolic blood pressure, and diastolic blood pressure. As predicted, all groups experienced physiological activation from their average baseline measure to the first physiological measurement in exposure session-1, as evidenced by the main effects of

time for heart rate,  $F(1, 59) = 62.95, p < .001, \eta^2 = 0.52$ , systolic blood pressure,  $F(1, 59) = 22.34, p < .001, \eta^2 = 0.28$ , and diastolic blood pressure,  $F(1, 59) = 4.39, p = .040, \eta^2 = 0.07$ . There were no group differences evident in the physiological data from baseline to first measurement in exposure-1. With regard to the activation of subjective fear in the initial minute of exposure session-1, there were no group differences between the experimental conditions (1<sup>st</sup> SUD rating:  $F(3, 59) = 0.75, p = ns, \eta^2 = 0.04$ ).

### **Analysis of Dependent Variables**

Univariate repeated measures ANOVAs were conducted on each of the dependent variables, assessing for change within (as assessed by the seven data points in each 20-minute exposure session) and between each of the two exposure sessions. Specifically, this resulted in an exposure session (exposure 1 and exposure 2) x measurement (7 time points per exposure session) x experimental group (groups 1-4) ANOVA for SUDS, heart rate, and blood pressure as outlined below. *T*-tests were conducted where necessary to further investigate significant findings.

#### **Within and between exposure session analysis.**

##### ***SUDS.***

As predicted, there was a significant decrease in subjective anxiety ratings both between<sup>8</sup>,  $F(1, 59) = 95.11, p < .001, \eta^2 = .62$  and within<sup>9</sup>  $F(2.6, 154.16) = 48.81, p <$

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<sup>8</sup> Significant between exposure session decrease refers to a significant reduction in the mean ratings (i.e., SUDs, Heart Rate, Blood Pressure) from exposure 1 to exposure 2 for all groups.

<sup>9</sup> Significant within exposure session decrease refers to a significant reduction across the seven measures (i.e. SUDs, Heart Rate, Blood Pressure) taken within each exposure session.

.001,  $\eta^2 = .453$ ) the two exposure sessions (see Figure 2.3). Again as predicted, the rate of this anxiety reduction was not the same for each group, as evidenced by the significant interaction effect of exposure and group  $F(3, 59) = 2.96, p = .040, \eta^2 = .13$ ).

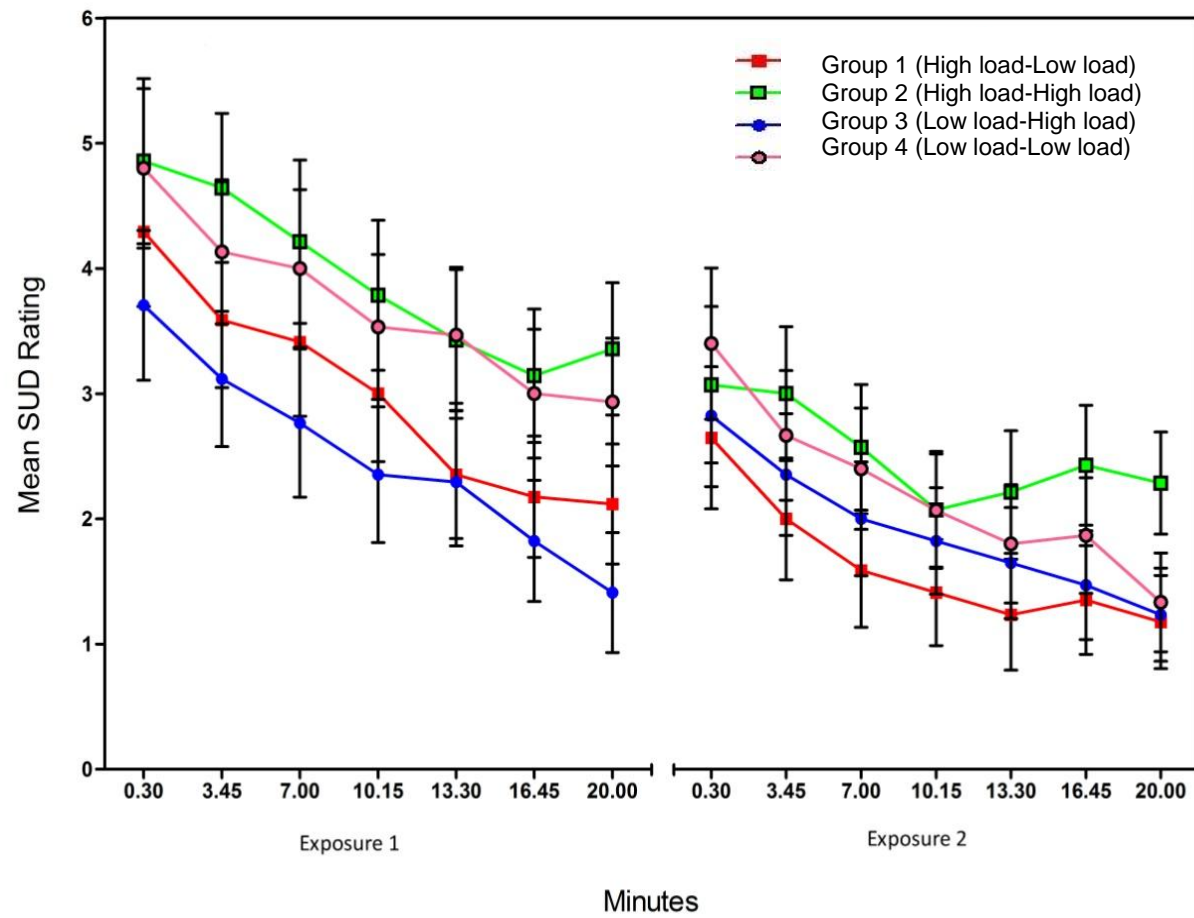
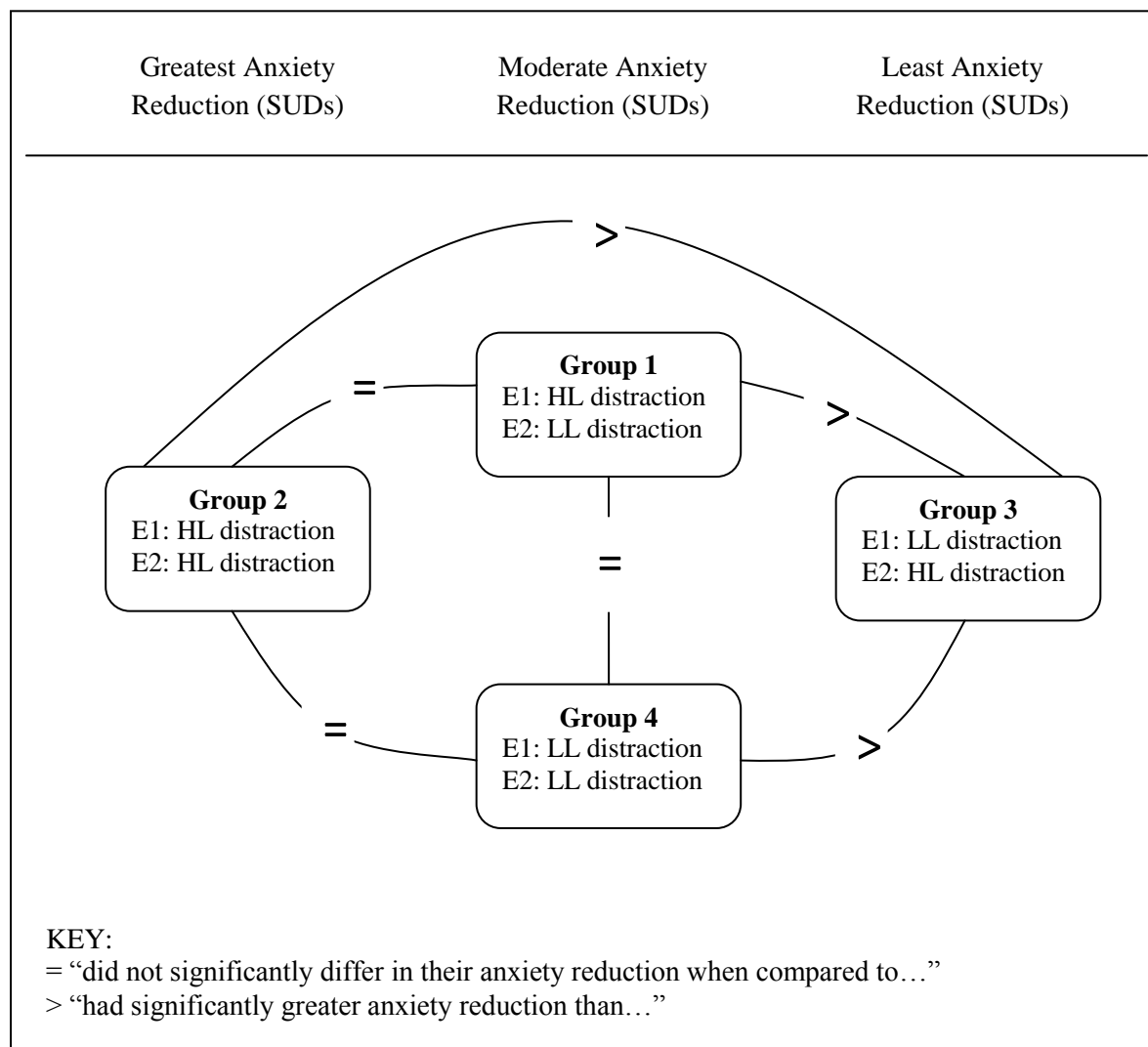


Figure 2.3. Mean SUD ratings (+SE) during exposure sessions for each group

In order to determine the specific groups between which the significant differences existed, further analyses were conducted, comparing each experimental group to another using a series of repeated measures ANOVAs. These analyses revealed several trends that indicate not all groups' SUD ratings decreased to the same extent from exposure session 1 to exposure session 2, and also offer support to our current hypotheses. For instance, group 3 (LL followed by HL distraction) consistently did significantly worse than the other experimental conditions, in that participants in this group underwent a slower rate of anxiety reduction, as assessed by subjective anxiety ratings, than group 1 (HL-LL;  $F(1, 32) = 5.78, p = .022, \eta^2 = .15$ ), group 2 (HL-HL;  $F(1, 29) = 5.97, p = .021, \eta^2 = .17$ ), and group 4 (LL-LL;  $F(1, 30) = 8.14, p = .008, \eta^2 = .21$ ).

As predicted, group 2 (HL followed by HL distraction) performed similarly to group 4 (LL followed by LL distraction), indicating SUD ratings decreased to a similar extent for these participants in these experimental groups,  $F(1, 27) = .042, p = ns, \eta^2 = .00$ . Interestingly, group 2 performed similarly to that of group 1 (HL followed by LL distraction), indicating that being less distracted in the second exposure, where anxiety was lower, did not hold strong benefits for anxiety reduction with the current sample,  $F(1, 29) = .009, p = ns, \eta^2 = .00$ ; see Figure 2.4.

Contrary to the prediction that high-load distraction followed by low-load distraction would result in more rapid anxiety reduction, compared to that of low-load in both exposure sessions, group 1 (HL followed by LL distraction) performed similarly to group 4 (LL followed by LL;  $F(1, 30) = .099, p = ns, \eta^2 = .003$ ).



*Figure 2.4.* The four groups’ anxiety reduction, as measured by SUD, over the two exposure sessions.

### **BAT.**

As predicted, there was a significant increase in the number of steps achieved on the BAT over time at pre, mid and post-treatment,  $F(1.219, 118) = 19.66, p < .000, \eta^2 = .250$ . Contrary to prediction, the rate at which these tasks were achieved over time did not differ significantly between groups,  $F(3.66, 118) = 1.02, p = ns, \eta^2 = .049$ .

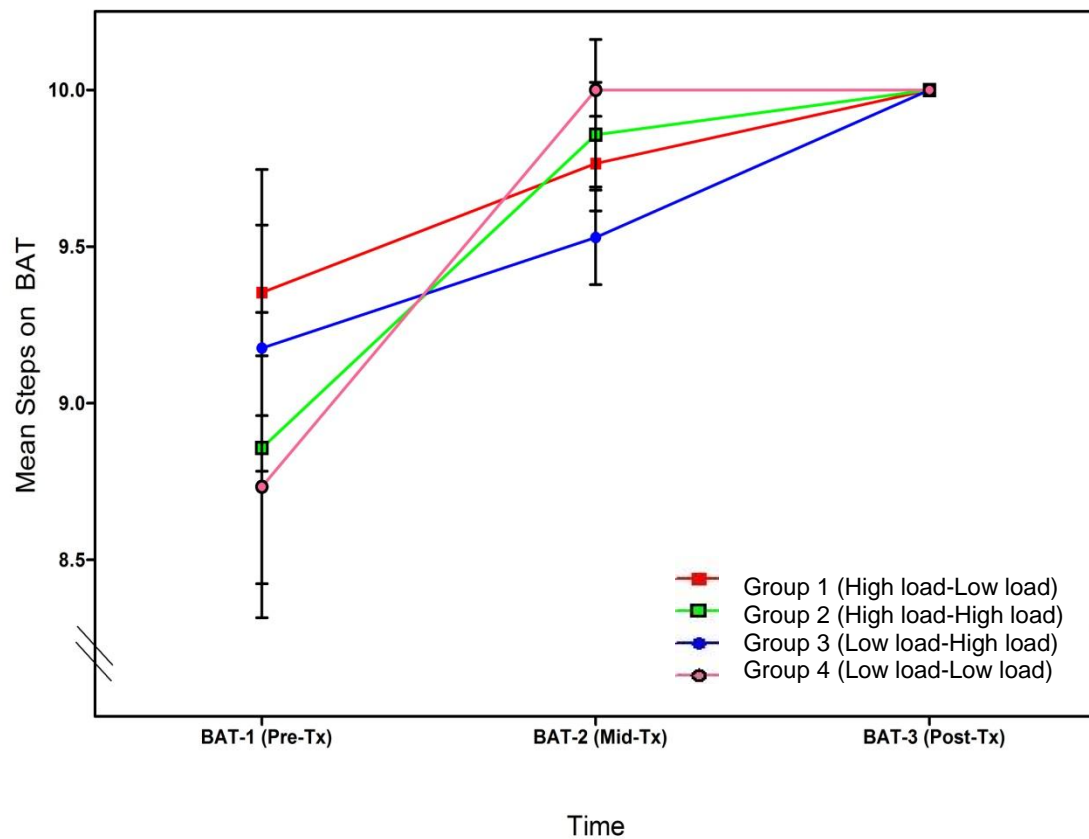


Figure 2.5. Mean number of steps achieved on the BAT (+SE) at pre, mid, and post-treatment for each experimental condition.



***Physiological data.***

Means and standard errors of physiological measurements during baseline, exposure session-1 and exposure session-2 are presented in Table 2.3.

Table 2.3  
*Mean Physiological Reactivity for the Four Experimental Conditions at Baseline, Session 1, and Session 2.*

Measure	Condition	Time		
		Baseline	Session-1	Session-2
Heart rate <sup>1</sup>	Group 1	69.97 (2.50)	77.04 (2.70)	72.49 (2.32)
	Group 2	75.64 (2.74)	83.51 (2.98)	78.28 (2.55)
	Group 3	70.94 (2.50)	77.43 (2.70)	74.92 (2.32)
	Group 4	73.10 (2.65)	78.71 (2.88)	74.34 (2.47)
Systolic Blood pressure <sup>2</sup>	Group 1	108.41 (3.28)	112.42 (3.00)	106.78 (3.12)
	Group 2	113.64 (3.61)	114.56 (3.31)	111.61 (3.44)
	Group 3	114.35 (3.28)	112.39 (3.01)	110.49 (3.12)
	Group 4	111.03 (3.50)	113.10 (3.20)	111.05 (3.32)
Diastolic Blood Pressure <sup>3</sup>	Group 1	73.53 (1.97)	74.33 (1.91)	71.21 (1.78)
	Group 2	76.43 (2.17)	76.04 (2.10)	74.75 (1.96)
	Group 3	76.32 (1.97)	74.04 (1.91)	73.36 (1.78)
	Group 4	73.97 (2.10)	73.91 (2.03)	74.22 (1.89)

*Note:* Means for each session represent estimated marginal means calculated from the seven measures taken in each exposure session. Values in parenthesis represent the standard error of the mean.

<sup>1</sup> At pre-treatment there were no differences between conditions,  $F(3, 59) = 1.69$ ,  $p = ns$ ,  $\eta^2 = .08$ .

<sup>2</sup> At pre-treatment there were no differences between conditions,  $F(3, 59) = .18$ ,  $p = ns$ ,  $\eta^2 = .01$ .

<sup>3</sup> At pre-treatment there were no differences between conditions,  $F(3, 59) = .52$ ,  $p = ns$ ,  $\eta^2 = .03$ .

*Heart rate.*

As predicted, there was a significant decrease in heart rate both between,  $F(1, 59) = 71.83, p < .001, \eta^2 = .55$ , and within,  $F(3.92, 354) = 4.37, p < .002, \eta^2 = .07$ , the two exposure sessions. Contrary to prediction, however, the extent to which this reduction occurred from exposure 1 to exposure 2, did not significantly differ between groups,  $F(3, 59) = 1.45, p = ns, \eta^2 = .07$ .

*Systolic blood pressure.*

As predicted, there was a significant decrease in systolic blood pressure both between,  $F(1, 59) = 21.87, p < .001, \eta^2 = .27$ , and within,  $F(4.69, 354) = 13.55, p < .001, \eta^2 = 0.19$ , the two exposure sessions. Contrary to prediction, however, the extent to which this reduction occurred from exposure 1 to exposure 2 did not significantly differ between groups,  $F(3, 59) = 1.79, p = ns, \eta^2 = 0.08$ .

*Diastolic blood pressure.*

As predicted, there was a significant decrease in diastolic blood pressure both between,  $F(1, 59) = 5.11, p = .028, \eta^2 = .08$ , and within,  $F(4.83, 354) = 5.38, p < .001, \eta^2 = 0.084$ , the two exposure sessions. Contrary to prediction, however, the extent to which this reduction occurred from exposure 1 to exposure 2 did not significantly differ between groups,  $F(3, 59) = 1.92, p = ns, \eta^2 = 0.09$ .

### **Pre-treatment vs. post exposure session-2.**

#### ***FSQ.***

As predicted (as shown in Table 2.4), there was a significant decrease in participants' total scores on the FSQ from pre-treatment to post-treatment, indicating that the exposure treatment was effective,  $F(1, 59) = 61.12, p < .001, \eta^2 = .51$ . Interestingly (and contrary to prediction), groups did not significantly differ in this reduction on the FSQ from pre-treatment to post-treatment,  $F(3, 59) = .92, p = ns, \eta^2 = 0.05$ .

Again, as predicted, there was a significant decrease in scores on FSQ subscale-1 (avoidance/help seeking) from pre-treatment to post-treatment,  $F(1, 59) = 80.66, p < .001, \eta^2 = .58$ . Contrary to prediction, however, groups did not significantly differ in this reduction from pre- to post-treatment,  $F(3, 59) = 1.63, p = ns, \eta^2 = .08$ .

This trend also applied to FSQ subscale-2 scores (fear of harm) in that there was a significant decrease from pre-treatment to post-treatment,  $F(1, 59) = 34.90, p < .001, \eta^2 = .37$ , but no significant differences between groups in this reduction from pre-treatment to post-treatment,  $F(3, 59) = 0.371, p = ns, \eta^2 = .02$ . These results indicate that the exposure treatment was indeed effective, but the group differences observed with ratings of subjective fear between exposure sessions did not generalise to this measure.

Table 2.4  
*Mean FSQ Scores for the Four Experimental Conditions at Pre-treatment and Post-treatment*

Measure	Condition	Time	
		Pre-Treatment	Post-Treatment
FSQ	<i>Total</i> <sup>1</sup>		
	Group 1	50.82 (4.87)	37.65 (4.67)
	Group 2	52.79 (5.37)	42.07 (5.15)
	Group 3	43.41 (4.87)	34.35 (4.67)
	Group 4	52.07 (5.18)	36.13 (4.98)
	<i>Subscale 1</i>	<i>(Avoidance/Help Seeking)</i> <sup>2</sup>	
	Group 1	24.24 (2.57)	16.88 (2.51)
	Group 2	25.92 (2.83)	19.50 (2.77)
	Group 3	21.29 (2.57)	16.47 (2.51)
	Group 4	26.53 (2.74)	16.93 (2.68)
	<i>Subscale 2</i>	<i>(Fear of Harm)</i> <sup>3</sup>	
	Group 1	26.59 (2.57)	20.77 (2.39)
	Group 2	26.86 (2.83)	22.57 (2.64)
	Group 3	22.12 (2.57)	17.88 (2.39)
	Group 4	25.53 (2.74)	19.20 (2.55)

*Note:* Values in parenthesis represent the standard error of the mean.

<sup>1</sup> At pre-treatment there were no differences between conditions,  $F(3, 59) = .75, p = ns, \eta^2 = .04$ .

<sup>2</sup> At pre-treatment there were no differences between conditions,  $F(3, 59) = .79, p = ns, \eta^2 = .04$ .

<sup>3</sup> At pre-treatment there were no differences between conditions,  $F(3, 59) = .70, p = ns, \eta^2 = .03$ .

### Further Investigation of Counting Errors

As mentioned earlier in this section (see SUD results), the different groups did not perform as expected, in that group 1 (HL followed by LL distraction) did not experience significantly greater reductions in anxiety than the other three groups. In fact, group 1's anxiety levels reduced at a similar rate to that of group 2 (HL followed

by HL distraction) and group 4 (LL followed by LL distraction). Group 3 (LL followed by HL distraction) performed as expected, however, with significantly smaller reductions in anxiety than all other groups. In an attempt to account for some of the unexpected findings, examination of the experimental manipulation is necessary, as is further examination of the distraction load and associated counting errors.

It was observed during data collection that participants in group 2 (HL followed by HL distraction) made fewer errors at time 2 than at time 1: a potential indicator that practice effects were at play. Figure 2.6 suggests that the distraction load/counting error relationship expressed itself as expected for most groups.

To determine the statistical significance of the suspected practice effects and the potentially compromised experimental manipulation, paired samples *t*-tests were conducted for each group. As predicted, for participants in group 1 (who underwent high-load distraction during exposure 1 followed by low-load distraction during exposure 2), the number of counting errors significantly reduced from time 1 ( $M = 4.06$ ;  $SD = 2.44$ ) to time 2 ( $M = .47$ ;  $SD = .72$ ;  $t(16) = 5.91$ ,  $p < .001$ ). This finding indicates that the distraction task at time 1 demanded significantly more working memory than at time 2.

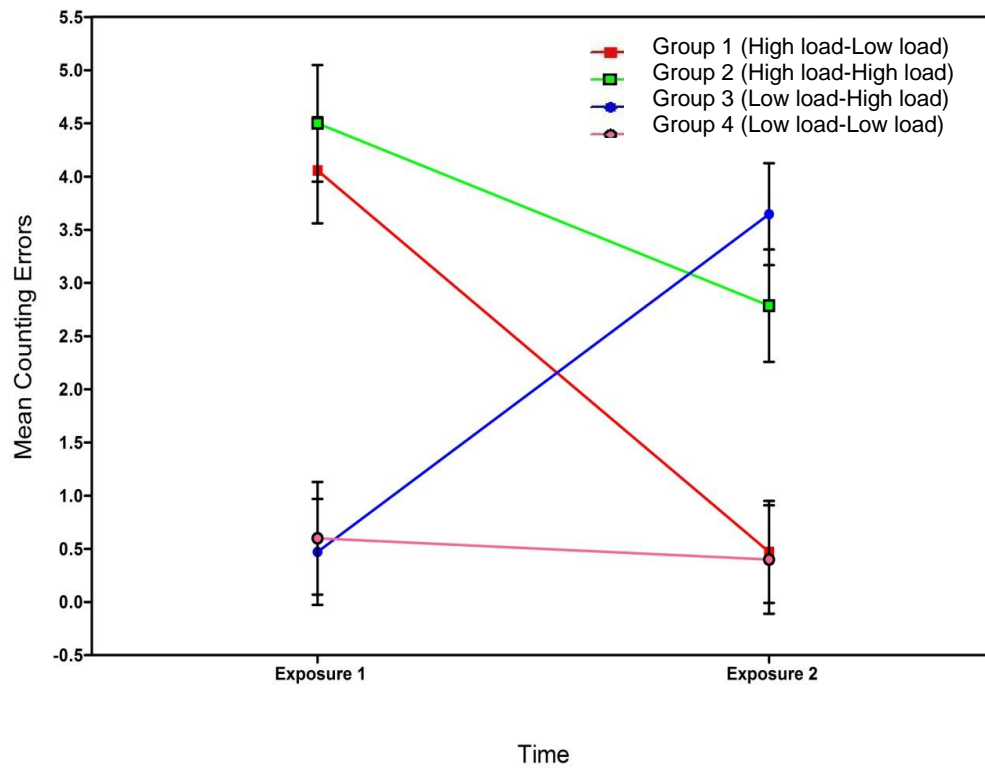


Figure 2.6. Mean number of counting errors (+SE) at exposure 1 and exposure 2 for each group

Also, as predicted, for participants in group 3, who underwent low-load distraction during exposure 1 followed by high-load distraction during exposure 2, the number of counting errors significantly increased from time 1 ( $M = .47$ ;  $SD = .94$ ) to time 2 ( $M = 3.65$ ;  $SD = 2.96$ ;  $t(16) = -4.06$ ,  $p = .001$ ). This finding indicates that the distraction task at time 1 demanded significantly less working memory than at time 2.

Again, as predicted, for participants in group 4, who underwent low-load distraction during both exposure sessions, the number of counting errors did not significantly differ from time 1 ( $M = .60$ ;  $SD = 1.12$ ) to time 2 ( $M = .40$ ;  $SD = .83$ ;  $t(14) =$

.544,  $p = ns$ ). This finding indicates that the distraction task at time 1 required the same amount of working memory at time 2 and that distraction load was held fairly stable over time. It also suggests, due to the extremely simple nature of the low-load counting task, that participants could not significantly improve from time 1 to time 2, indicating the presence of floor effects.

Finally, as predicted, for participants in group 2, who underwent high-load distraction during both exposure sessions, the number of counting errors did indeed significantly decrease from time 1 ( $M = 4.50$ ;  $SD = 3.06$ ) to time 2 ( $M = 2.79$ ;  $SD = 2.36$ ;  $t(13) = 2.87$ ,  $p = .013$ ). This finding indicates that the distraction load did not hold stable over time as intended and that practice effects were indeed at play, reducing the load imposed by the ‘high-load’ task at time 2.

### **Counting error stability for high-load and low-load tasks.**

In addition to assessing the counting error rates across time, it was important to determine that the counting error rate, and associated working memory load, held stable whenever a participant was undergoing high- or low-load distraction, regardless of their group allocation. For instance, with regard to high-load distraction, participants in group 1 who underwent high-load distraction at time 1 show similar performance to those participants in group 3 who underwent high-load distraction at time 2. Those participants in group 2 should also have shown equivalent distraction effects at time 1 to

these above-mentioned groups<sup>10</sup>. In order to test this, a one-way between-groups ANOVA was conducted on the following data (see Figure 2.7). As predicted, across conditions where participants were undergoing high-load distraction (irrespective of group or time), the rate of counting errors did not significantly differ, indicating that the high-load distracter imposed similar load on these participants' working memory,  $F(2, 45) = .35, p = ns, \eta^2 = .02$ .

Group	Exposure 1 Distracter	Exposure 2 Distracter
1	HL	LL
2	HL	HL
3	LL	HL
4	LL	LL

*Note:* Circled areas represent data that were included in the one-way ANOVA.





*Figure 2.7.* Participants used in one-way ANOVA to determine counting error stability for high-load distracter task.

Similarly, with regard to low-load distraction, participants in group 1 who underwent low-load distraction at time 2, should show similar performance to those participants in group 3 who underwent low-load distraction at time 1. Those participants in group 4 should also have been equally distracted at time 1, and time 2, to the above-mentioned groups. In order to test this, two separate one-way between-groups

<sup>10</sup> Participants in group 2, undergoing HL distraction at exposure 2 are excluded from this discussion, due to the confirmed presence of practice effects.



ANOVAs were conducted (see Figure 2.8)<sup>11</sup>. As predicted, across conditions where participants were undergoing low-load distraction (irrespective of group or time), the rate of counting errors did not significantly differ, indicating that the low-load distracter had similar effects regardless of condition (Analysis 1;  $F(2, 46) = .10, p = ns, \eta^2 = .00$ ; Analysis 2;  $F(2, 46) = .04, p = ns, \eta^2 = .00$ ).

Group	Exposure 1 Distracter	Exposure 2 Distracter
1	HL	
2	HL	HL
3		HL
4		

*Note:* Circles denote data used in analysis 1, triangles denote data used in analysis 2.

*Figure 2.8.* Participants used in two separate one-way ANOVAs to determine counting error stability for low-load distracter task.

## Discussion

The aim of this study was to replicate and extend on the Johnstone and Page (2004, 2007c) studies that found a beneficial effect of distraction. Specifically, the present study replicated the Johnstone and Page (2007c) study, where an already-operationalised counting task (based on working memory capacity) served as the distraction. Levels of distraction varied for each experimental condition across the two

<sup>11</sup> Two separate between groups ANOVAs were conducted (as opposed to one) to prevent participants in group 4 having their exposure 1 data compared with their exposure 2 data in a within-groups analysis.

exposure sessions, and fear reduction was assessed via in-session subjective fear ratings, physiological arousal in conjunction with a behavioural approach task, and a standardised questionnaire regarding the cognitive and behavioural avoidance of spiders (FSQ).

### **Findings regarding Overall Treatment Effectiveness of Distracted Exposure**

The prediction that all experimental groups would experience significant fear reduction from pre-treatment to post-treatment under distracted conditions was confirmed, thereby indicating that the exposure treatment was effective. Regardless of experimental condition, all participants demonstrated a significant reduction in subjective fear ratings both within- and between-exposure sessions. This finding is in keeping with Craske et al. (1991), Penfold and Page (1999), Oliver and Page (2003, 2008) and Johnstone and Page (2004, 2007c) who also found a beneficial effect of distraction with regard to subjective ratings.<sup>12</sup>

As predicted, this significant fear reduction, observed in subjective ratings of anxiety, also generalised to physiological indices, where a significant within- and between-exposure session reduction was found for heart rate, systolic blood pressure and diastolic blood pressure. Whilst this result was consistent with those of other distraction studies that have demonstrated physiological reductions in anxiety and subjective ratings (i.e., Antony et al., 2001; Grayson et al., 1982; Haw & Dickerson,

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<sup>12</sup> These studies found a beneficial effect of distraction when compared to focussed exposure. Although the present study did not make such a comparison, the current findings still reinforce these earlier findings that fear can still significantly reduce under distracted conditions.

1998; Johnstone & Page, 2007c), there have also been many distraction studies that have experienced desynchrony between the response systems. Specifically, having demonstrated the beneficial effects of distracted exposure through subjective measures, findings did not generalise to physiological measures (Craske et al., 1991; Grayson et al., 1986; Johnstone & Page, 2004, 2007c; Oliver & Page, 2003). Despite the number of distraction studies that have generated consistencies between the subjective and physiological response systems, these consistencies appear to occur more frequently when there has been no distraction advantage found on subjective measures and, subsequently, no distraction advantage found on physiological measures. The present study represents one of the first studies to demonstrate the beneficial effects of distraction both via subjective ratings and physiological ratings.

Also, as predicted, the significant reductions in anxiety evident in subjective and physiological indices also generalised to the behavioural response system, with significant increases in steps achieved over time on the BAT from pre- to post-treatment for all participants (regardless of experimental condition). In addition, the prediction that the reductions observed on all of the above-mentioned measures would also extend to a psychometric self-report questionnaire related to the cognitive and behavioural responsiveness to spiders was confirmed. As predicted, there was a significant decrease in both total and subscale scores on the FSQ for all groups from pre-treatment to post-treatment, indicating that participants' general level of responsiveness to spiders significantly reduced.

The consistent reductions in fear on subjective, physiological, behavioural and a self-report measure of spider fear are important, as these results overcome the inconsistencies in previous studies where desynchrony between the response systems has occurred. When desynchrony occurs, that is, where not all response systems demonstrate consistent reductions, it casts doubt upon findings, questioning the legitimacy of treatment effectiveness in general and, more specifically, the distraction advantage.

The confirmation of the hypothesis that participants, irrespective of experimental condition, would experience a significant reduction in spider-related fear from pre- to post-treatment brings into question the core assumptions of the emotional processing model that predicts fear reduction can only take place when full-attention is paid to the feared stimulus (Foa & Kozak, 1986, 1998). The present study acts as evidence to the contrary, especially considering the significant activation of fear from baseline (a prerequisite for effective emotional processing) for all participants on all physiological measures.

The current findings also offer further support to the theory that limiting the rehearsal of meaning information during exposure, and allowing more corrective information into the network, may have a beneficial effect on fear reduction. Although the emotional processing model maintains that the use of distraction during exposure should be counterproductive and impede fear reduction, the central components of the model, specifically, the basic theory relating to the composition of the fear network, can

explain these findings of beneficial effects. In particular, it is proposed that the limitation of conscious access to the spider-relevant (fear-saturated) thoughts, while the rest of the fear network is activated, results in a more rapid dissociation between elements of the fear structure, resulting in more rapid fear reduction. Whilst access to meaning elements in the fear network is thought to be limited, some access to meaning information is still possible, according to Cowan's (1995, 1999) embedded process model of working memory. The Cowan model supports the notion that some of the focus of attention should still be dedicated to attend to fear-relevant meaning information. Therefore, in keeping with the predictions and subsequent confirmatory findings of the Johnstone and Page (2007b, 2007c) studies, maximum benefit of distracted exposure occurs when meaning activation is partially limited, so that the conscious capacity-limited working memory space is not saturated with catastrophic fear-saturated thoughts, *but* when some focus of attention still remains for more direct modifications of these unhelpful cognitions. This should result in greater dissociation between the elements and more rapid emotional processing. The results from the present study go some way in offering further support to this notion. The next set of hypotheses, pertaining to the interaction between fear level and distraction load, are discussed below with respect to the literature on distraction and working memory.

### **Findings regarding the Interaction between Fear Level and Distraction Load (Specific to Experimental Condition)**

The hypothesis that individuals with relatively higher levels of stimulus-bound fear would benefit more from a higher-load distracter and those with lower levels of

stimulus-bound anxiety would benefit from a lower-load distracter was partially supported. Subjective measures of distress taken during the two exposure sessions, not only demonstrated a significant within- and between-session reduction in subjective fear but they also, as predicted, demonstrated that the rate of this reduction was not the same for each group<sup>13</sup>.

The results of the current study indicate (via data from all response systems) that the exposure treatment was effective in that all participants (regardless of experimental condition) demonstrated a significant within- and between-session reduction in anxiety. Therefore, it can be assumed that anxiety was relatively higher in the first exposure session and relatively lower in the second.

As predicted, group 1's (HL-LL) anxiety reduction was significantly greater than group 3's (LL-HL), indicating that undergoing a higher-load distraction first, followed by a low-load distraction, resulted in more rapid fear reduction for the current sample. This finding is not surprising, given that group 1 was expected to perform optimally over time, due to fear level being matched with distraction load during *both* exposure sessions. Further, group 3's (LL-HL) anxiety reduction was significantly less than all other groups. This finding offers further support for the hypotheses regarding the interaction between fear level and distraction load, as this group was expected to perform poorly relative to the other experimental groups, due to fear level and

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<sup>13</sup> Whilst it is imperative (based on Lang, 1998) to consider the data from all three response systems (subjective, physiological and behavioural), it is the subjective and behavioural components of fear that are definitional and essential (Rachman, 1998). For instance, experiencing physiological activation in the absence of subjective and behavioural reports of fear does not constitute fear, as examined here.

distraction load being matched in *neither* exposure session. Also, as predicted, group 2 (HL-HL) and group 4 (LL-LL) experienced a similar (and moderate) level of anxiety reduction. This finding was also predicted and adds further support to the hypothesised interaction, as distraction load was optimal in one exposure but not the other for both groups.

These findings were expected, and are consistent with previous studies that have demonstrated that fear level, when matched with distraction load, results in greater fear reduction (Johnstone & Page, 2004, 2007b, 2007c; Penfold & Page, 1999). They also indicate that the attentional forces (i.e., anxiety orienting participants' attention *toward* the phobic stimuli, and distraction orienting attention *away* from the phobic stimuli) may be best observed and understood within an exposure context when participants' anxiety levels and distraction loads are assessed over time (as opposed to assessing pre-treatment anxiety levels and attempting to match these with distraction-loads). The above-mentioned findings reinforce those of Johnstone and Page (2007c) and offer further support for the relative benefit of distraction in those circumstances where not too much attention is absorbed by the distracter (which would allow insufficient corrective stimulus-relevant information into the focus of attention, ultimately resulting in a slower reduction in fear) *and* where not too little distraction is used (which would allow too much fear-saturated meaning information to dominate the focus of attention, to a point that does not allow enough corrective information about the feared stimulus to integrate into the fear network). Therefore, within the parameters of the embedded process model, these findings suggest the optimal distraction advantage occurs when

cognitive rehearsal of fear-saturated thoughts is limited, but enough corrective meaning information is still able to access and modify the fear network. This advantage can be achieved when fear level and distraction load are matched over time. In other words, it is proposed that the interaction between fear level and distraction load determines how demanding the distracter is, which, in turn, determines how much fear is then reduced. Furthermore, it is likely that the variation in this delicate balance of fear level and distraction load that accounts for the variation in treatment effects (i.e., whether it is a help or a hindrance to anxiety reduction). Despite these confirmatory findings, there were also some results that were not predicted but are still in need of explanation.

**Group 1 (HL-LL) performed similarly to Group 2 (HL-HL).**

With regard to reductions in subjective ratings of distress (SUD), group 1 (HL-LL) performed similarly to group 2 (HL-HL). This result was unexpected. It had been hypothesised that group 1's participants would experience the greatest reduction in anxiety over time, due to fear level and distraction load being matched in both exposure sessions, as opposed to group 2's participants whose fear level and distraction load were matched in exposure one but not in exposure two. This unexpected finding suggests that being less distracted in the second exposure, where anxiety was lower, did not hold strong benefits for anxiety reduction with the current sample. This result may be easily accounted for, however, if we explore the possibility of practice effects that may have been at play when participants in group 2 (HL-HL) naturally improved their counting in the second exposure session. If these participants improved in their ability to count backwards by threes, it is likely that the counting task would have been less distracting



(placing less demand on working memory) during the second exposure than the first exposure. In this sense, the high-load distraction task for group 2 (HL-HL) in the second exposure becomes more like that of a low-load task. If practice effects were at play, and participants in group 2 (HL-HL) did improve their counting during the second exposure (and were therefore less distracted), this should have shown as a significant reduction in counting errors from exposure one to exposure two. This prediction was confirmed, indicating that the distraction task at time 1 was significantly more demanding than at time 2 for participants in group 2 (HL-HL). It also sheds light on why this group performed similarly to that of group 1 (HL-LL), in that both of these experimental groups were essentially operating as high-load followed by lower-load, as opposed to HL-LL (group 1) and HL-HL (group 2), as originally intended.

**Group 1 (HL-LL) performed similarly to Group 4 (LL-LL).**

Another unexpected result, with regard to the reduction of subjective ratings of anxiety over time, was that group 1 (HL-LL) performed similarly to group 4 (LL-LL). It had been hypothesised that group 1's participants would experience the greatest reduction in anxiety over time, due to fear level and distraction load being matched in both exposure sessions, as opposed to group 4 where fear level and distraction load were matched in exposure two, but not exposure one. This unexpected finding suggests that the relatively higher distraction load in exposure one for group 1 (HL LL) did not hold strong benefits for the current sample. This finding could be explained, however, by examining the current sample's average in-session anxiety ratings. Previous studies that have demonstrated that high-load distraction is more beneficial when the anxiety level is

high, have used participants with relatively higher levels of self-reported subjective anxiety, as assessed in the first 30 seconds of exposure treatment. For instance, participants in the Johnstone and Page (2004, 2007b, 2007c) studies reported an average pre-treatment SUD rating of 8-9 out of a possible 10. The present study, by contrast, had an average pre-treatment SUD rating of between 4-5 out of a possible 10. The disparity between the present study and the Johnstone and Page studies with regard to pre-treatment SUD levels is likely to be attributable to the phobic level of fear of their sample, as all participants were required to meet criteria for specific phobia (animal type) to be able to partake in the study<sup>14</sup>. Their participants were also required to score a minimum of 54 (out of a possible 90) on the FSQ. As the present study had no official screening criteria<sup>15</sup>, a relatively lower-anxiety sample was subsequently recruited and, as such, the proposed benefit of a high-load distracter in the initial exposure session did not have a significantly beneficial effect. In other words, it was likely that a lower-load distraction task in exposure 1 matched the sample's relatively lower level of anxiety, resulting in a similar level of anxiety reduction for both groups.

The unexpected performance of the experimental groups, as outlined above, highlights some limitations with respect to the effectiveness of the experimental manipulation in those circumstances where participants are required to repeat the same

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<sup>14</sup> Only 25% of participants met criteria for specific phobia in the current study (as assessed by the ADIS), as opposed to 100% in the Johnstone & Page (2004, 2007b, 2007c) studies.

<sup>15</sup> To be eligible to participate in the current study, participants simply had to answer 'yes' to any of the following questions: If you saw a spider right now would you be afraid of it? Do you feel nervous when you see spiders? Do you have little confidence that you'd be able to deal effectively with a spider if you came across one?

counting task during both exposure sessions, as seen in group 2 (HL-HL) and group 4 (LL-LL).

The next study in the current research program addresses this limitation by using a CPT-based check of working memory to establish whether or not practice effects were indeed at play for groups 2 (HL-HL) and 4 (LL-LL). The same CPT program will be used to operationalise some alternative counting tasks that will offer a more stable demand on working memory over time.

It also may be likely that the fear level of the current sample was inadequate. It appears likely that participants' fear networks were not cohesive enough to produce a sufficiently intense fear reaction for the high-load distraction to display any benefits over the low-load distraction. The current research program addresses this limitation in the subsequent replication study (Study 3) by introducing a screening procedure to ensure at least a moderately fearful sample.

Another problem with the current study is that the change profile observed for experimental groups with regard to SUD ratings was not mirrored by the changes in physiological reductions. Although participants demonstrated significant within- and between-session physiological habituation, indicating consistency *within* the physiological response system, the rate of reduction did not significantly differ between groups or reduce in a way consistent with that of reductions in subjective ratings of fear, indicating desynchrony *between* response systems. Desynchrony between the subjective (self-report) and physiological report systems has been well documented in earlier

distraction studies, such as Grayson et al. (1986), Craske et al. (1991), Mohlman & Zinbarg (2000), Johnstone and Page (2004, 2007c), and Oliver and Page (2003) who found that participants reported a decrease in subjective reports of fear when heart rate or blood pressure remained relatively unchanged. Given that these previous studies made comparisons between quite different experimental conditions (i.e., distraction versus focusing), rather than comparing conditions with varying levels of distraction (as was the case with the current study), it is not surprising that desynchrony between response systems occurred. The desynchrony observed in the current study supports the notion that the fear network structure was less cohesive, as would be expected with a non-clinical sample, and reinforces the notion that a higher anxiety sample is warranted in future studies to attempt to limit desynchronous findings. The desynchrony also highlights the importance of assessing anxiety using all three response systems, as opposed to drawing conclusions based solely on decreases in physiological reactivity.

Interestingly, the current study found no significant differences between experimental conditions with regard to behavioural avoidance (as assessed by pre-, mid- and post-treatment BATs). Although it was predicted that the group differences observed on the subjective measure of anxiety would generalise to the BAT, it was not surprising that this did not occur, when taking into consideration previous distraction studies. For instance, several studies that found significant differences between experimental groups with regard to SUD ratings, also found no significant difference between experimental groups on the BAT (Johnstone & Page, 2007b; Mohlman & Zinbarg, 2000; Penfold & Page, 1999; Rodriguez & Craske, 1995). In fact, Johnstone

and Page (2004) represents the only distraction study to-date that has demonstrated the beneficial effects of distraction via subjective and behavioural measures of anxiety. It is important to note that the experimental groups used in the Johnstone and Page (2004) study (i.e., focused exposure where participants were engaged in conversation about spiders versus distracted exposure where conversation was stimulus-irrelevant) were experimentally different from the groups of the current study where participants underwent different levels of distraction. This difference between the two studies in the nature of the experimental groups might mean that group differences were more easily detected in the Johnstone and Page (2004) study.

The lack of group differences on the BAT in the current study could also be explained by the relatively low-anxiety sample used, due to a lack of screening process implemented during the recruitment process. It is possible that the fear level of participants was not high enough to elicit the required level of behavioural avoidance, in order to show as a significant improvement over time. Further, this initial low-anxiety level may have resulted in ceiling effects for the BAT, in that participants were able to complete 9 out of the 10 tasks (on average) on their pre-treatment BAT. This observed ceiling effect could also have been due to hierarchy items being too easy, which would make the measure insensitive to all but the most severe fears. Participants from the Johnstone and Page (2004) study, by contrast, completed only 7 out of the 10 BAT items on average *and* had a clinical level of fear (i.e., met criteria for specific phobia). It is evident that not only does the anxiety level of participants need to be higher, but an increase in the difficulty of BAT items is needed in order to increase the sensitivity of

this measure and subsequently increase the likelihood that significant group differences will be observed. It is likely that recruiting a higher anxiety sample may also increase the likelihood of finding group differences on the self-report measure of spider-related fear (FSQ), as again, unlike the Johnstone and Page (2004) study, the significant group differences observed in the present study of subjective indices did not generalise to this measure. These limitations will be addressed in Study 3.

Overall, Study 1 demonstrated that despite cognitive attention being allocated to a non-feared stimulus-related counting task that taxes working memory, anxiety still diminished significantly, as evidenced by physiological, subjective and behavioural reductions, both within- and between- exposure sessions for all groups. In addition, Study 1 offers further evidence to support the hypothesis that an interaction between anxiety level and distraction load exists. Higher levels of anxiety benefitted more from a high-load distracter, whereas lower levels of anxiety benefitted more from a low-load distraction, due to the significant group differences observed in the rate of reduction on subjective ratings of anxiety. The fact that these observed group differences did not generalise to any other measure of anxiety, however, indicates desynchrony between the response systems and detracts from the generalisability of the observed interaction.

In order to overcome the limitations of the present study and attempt to assess more closely the above-mentioned interaction, the remaining studies in this research program aim to do the following: Study 2 aims to, a) establish whether practice effects were indeed at play for group 2 (HL-HL) and group 4 (LL-LL), and b) operationalise

some replacement counting tasks that will offer a more stable working memory load (and, therefore, distraction task) over time. Study 3 aims to use these newly operationalised counting tasks on a higher anxiety sample, through introducing a screening procedure, and also aims to increase the difficulty of BAT items, in order to increase their sensitivity to group differences.

## **Chapter 3**

### **Study 2**

#### **Using a Continuous Performance Task to Establish Working Memory Load of Distraction Tasks, Screen for Practice Effects, and Re-operationalise Compromised Counting Tasks.**

The first study of this research program aimed to further investigate the effects of distraction by replicating and extending previous research (Johnstone & Page, 2004, 2007b, 2007c; Oliver & Page, 2003, 2008; Penfold & Page, 1999) that refuted predictions made by the emotional processing model (Foa & Kozak, 1986, 1998) that full attention to the feared stimulus is required for fear reduction to occur. An operationalised distraction task, inclusive of an objective check of cognitive attention, that loads on working memory, was used to overcome extensive variation in distracter types used in previous research. Fear reduced significantly for participants on all measures, casting further doubt on the explanatory power of the emotional processing model. Study 1 also found some support, in the pattern of subjective ratings of fear reduction, for an interaction between fear level and distraction load. High levels of stimulus-bound fear in exposure 1 reduced more rapidly when matched with a high-load cognitive distracter, as opposed to relatively lower levels of stimulus-bound fear in exposure 2 that reduced more rapidly when matched with a lower-load cognitive distracter.

The cognitive distracter (i.e., counting backwards) used in Study 1 had previously been operationalised by Johnstone and Page (2007c). Through use of a



continuous performance task and associated data pertaining to hit rate, reaction time and false alarm rate, the two counting tasks had been deemed to load differently on working memory. The high-load distracter (counting backwards by threes) required significantly more working memory, as evidenced by reduced hit-rate, slower reaction times and increased responding to false alarm targets, than the low-load distracter (counting back by ones). The prediction that fear level and distraction load would significantly interact was partially supported by participants' reduction of subjective fear ratings, in that participants in group 3 (LL-HL; where fear level and distraction load were matched in *neither* of the exposure sessions) experienced significantly less anxiety reduction than the other experimental groups. In addition, group 1 (HL-LL; where fear level and distraction load were matched in *both* exposure sessions) experienced significantly greater fear reduction than group 3 (LL-HL). In addition, group 2 (HL-HL) and group 4 (LL-LL) experienced a moderate level of fear reduction relative to groups 1 and 3, likely due to fear level and distraction load being matched in one exposure session but not the other, adding further support to the observed interaction.

It is necessary, however, to review the distraction tasks used in Study 1, due to suspected practice effects for participants in group 2 (required to count backwards by threes during both 20-minute exposure sessions) and group 4 (required to count backwards by ones during both 20-minute exposure sessions). Practice effects were suspected, due to observation by the investigator that participants in these experimental groups appeared to find the counting task easier during the second exposure. The likelihood that practice effects would occur was increased due to the longer exposure

durations used in Study 1 when compared with previous studies. Longer exposures were used in Study 1, in an effort to overcome limitations of previous studies (i.e., Johnstone & Page, 2004, 2007b, 2007c; Oliver & Page, 2003, 2008; Penfold & Page, 1999) that only included 10-minute exposure sessions. Further investigation into the counting error rates, which served as an objective check of cognitive attention, confirmed that practice effects were present for group 2 (HL-HL), due to a significant reduction in counting errors at exposure two when compared to exposure one. Practice effects were not confirmed for group 4 (LL-LL), possibly due to the presence of floor effects associated with the very simple nature of the counting task (i.e., participants were unable to improve significantly at counting backwards by ones because no skill-deficit existed). If the integrity of the distraction tasks used in Study 1 (for groups 2 and 4) were compromised by practice effects, it is likely that the experimental manipulation was also compromised, which might help to account for why group 1 (HL-LL) did not experience a significantly greater reduction in anxiety when compared to group 2 (HL-HL). It is likely that the latter group functioned more like a HL-LL group due to practice effects.

The use of longer exposure sessions remains necessary, in order to refute claims made by the emotional processing model that the distraction advantage observed in studies with shorter exposure durations represents nothing more than incomplete processing, rather than dissociation of the fear network elements resultant from effective emotional processing (Foa et al., 2006; Foa & Kozak, 1986, 1998). Given that a reduction in exposure duration is not desirable for use in a replication study, it remains

necessary to establish whether practice effects do occur when participants are undergoing the same counting task in both exposure sessions. In addition, if this is independently established, the need arises to operationalise new counting tasks that will create a stable working memory load over time for these participants. Study 2, therefore, has two primary aims.

### **Aim 1: Investigate Practice Effects**

The first aim of Study 2 was to simulate the counting tasks from Study 1 (specifically, those that required participants to repeat the same counting task during both exposure sessions) whilst participants undergo the CPT trial.

Two separate groups of participants were required to undergo a simulation of either the high-load cognitive distracter (counting backward by threes during both trials) or the low-load cognitive distracter (counting backwards by ones during both trials) while completing the CPT. Based on preliminary analysis of counting error rates for each experimental group across time in Study 1, it was predicted that practice effects would be present for participants simulating group 2's (HL-HL; counting backwards by threes during both exposure sessions) distraction task. Conversely, based on the analysis of counting errors for participants in group 4 (LL-LL) in Study 1, it was predicted that practice effects would not exist for participants in Study 2 simulating this counting task whilst undergoing the CPT, due to the simple nature of the task and likely presence of floor effects.

## **Aim 2: Operationalise New Distraction Tasks**

The second aim of Study 2 was to utilise findings from the above-mentioned simulations to determine which (if either) of the two distraction tasks require re-operationalising for use in a replication study (Study 3).

Further, the aim was to counteract any confirmed practice effects by introducing a more difficult counting task (which would load more heavily on working memory) for use with those participants where distraction load is to be held stable across both exposure sessions.

Given the hypothesis that practice effects *would* exist for participants simulating the high-load distraction task during both CPT trials, it is predicted that introducing a new distraction task, specifically, counting backwards by sevens, during the second trial, will offset practice effects (if confirmed) and ensure stable and uncompromised working memory load, and distraction level, across time.

## **Method**

### **Participants**

The sample consisted of 22 participants. Of these, nine were recruited from the Murdoch University undergraduate psychology subject pool. These participants were offered credit points for their participation. The remaining participants were recruited via on-campus advertisements and by word of mouth ( $n= 13$ ). These participants were recruited on a voluntary basis and were not offered any incentive to participate. There

were 9 males and 13 females and the mean age was 24.64 ( $SD= 4.68$ ). There were 8 participants in group 1, 7 participants in group 2, and 7 participants in group 3 (see Table 3.1.)

## **Materials**

### **Experimental hardware.**

Stimuli from the CPT program were presented to participants in MS-DOS mode on a 15.6-inch laptop monitor placed on a desk directly in front of the participant. The CPT program recorded all data related to the dependent variables and exported this to a file for viewing and analysis post-CPT completion. The beeping device used in Study 1 was used again to regulate participants' rate of counting. In keeping with the methodology of Study 1, beeps sounded once every three seconds, after which the participant was required to state the next number in sequence.

### **Experimental software.**

Participants completed two verbal CPT trials each. The verbal nature of the CPT task was designed to place demand on the phonological loop component of Baddeley's (1999) multiple component model of working memory, whilst still allowing the participant to concentrate on the visual component of the task (i.e., reading the letters and deciding whether they represent a 'target') and respond accordingly<sup>16</sup>. It required

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<sup>16</sup> Pilot testing by Johnstone and Page (2007c) determined these counting-based distraction tasks loaded significantly more heavily on verbal, as opposed to visual, working memory. Therefore, during exposure, these distraction tasks are likely to compete with the verbal rehearsal of spider-related thoughts consistent with the phobic experience.

participants to respond to targets by hitting a key on the computer only when both letters on the screen rhymed with the word “me” (e.g. ED, CB, DG). Participants were also informed that some letter pairs would contain one letter rhyming with “me”, but unless both letters rhymed, they were not to consider it a target.

Each verbal CPT trial presented 120 letter pairs to participants in the space of approximately 4 minutes. Letter pairs were displayed for 400 ms in duration and were spaced apart by intervals of 2000 ms. Letter pairs consisted of 22 capitalised English alphabet letters (excluding U, W, X and Z) of which 8 were target letters (B, C, D, E, G, P, T, V) and the remaining 14 letters were non-target letters. A total of 24 out of the 120 letter pairs displayed during each trial were target pairs. There were 12 false alarm pairs (that contained 1 target letter) and 84 filler pairs (containing no target letters). The task duration was designed to be relatively short, to minimise risk of fatigue effects and the subsequent contamination of data shedding light on working-memory load (Ballard, 2001). As mentioned earlier, the CPT program containing letter pairs was selected, as opposed to programs that contain single letters, in order to increase the sensitivity of the task, along with attentional resources it demands (Johnstone & Page, 2007a).

### **Experimental Design**

The study contained one between-subjects factor (group) which contained three levels representing each experimental group, and two within subjects factors (time) representing each of the two testing sessions. The dependent variables were hit rate (the proportion of targets participants were able to detect), reaction time (time participants

took to respond to the target), false alarm rate (the proportion of non-targets participants responded to by mistake that contained only one, not two of the target letters), fillers (the proportion of non-targets participants responded to by mistake that contained no target letters), and counting errors (average number of counting errors made within a random 60-second period). Optimal performance was indicated by increased hit rate, faster reaction time, and reduced response to false alarms and fillers.

### Procedure

Participants were randomly allocated to an experimental group, prior to their arrival at the testing session (see Table 3.1). Upon arrival, participants were briefed about what their participation would involve (See Appendix P), and informed consent was obtained (See Appendix Q). Participants were informed of the instructions relevant to either the high-load (See Appendix R) or low-load (See Appendix S) counting task (depending on group allocation) whilst participating in the verbal CPT trial on the monitor. Participants were informed that the computer-based CPT trial and the counting task were of equal importance and that they must try hard not to make mistakes for either task.

Table 3.1. *Three Experimental Groups used in Study 2*

	CPT Trial 1	CPT Trial 2
Group 1	High-load (threes)	High-load (threes)
Group 2	Low-load (ones)	Low-load (ones)
Group 3	High-load (threes)	High-load (sevens)

Participants were then provided instructions (See Appendix T) for, and were required to complete, a practice verbal CPT trial comprising 40 letter pairs (of which 12 were targets that required a participant response). Each letter pair was displayed for 400 ms and spaced apart by 2000 ms gaps. The practice trial was designed to be less demanding than the experimental trials, allowing participants an opportunity to familiarise themselves with the task (Johnstone & Page, 2007a). Participants were provided with feedback about their performance, and were required to complete the practice task with 100% accuracy to progress to the two experimental trials. Participants were not required to engage in the counting task during the practice trial, as the objective was to ensure that the participant was competent at the computer-based verbal CPT task. Thus, any subsequent performance deterioration was likely to be due to the introduction of the distracter itself (i.e., the counting task). Participants who did not perform to 100% accuracy with the computer-based verbal CPT task were asked to complete further practice trials until the 100% accuracy requirement was met.

Participants were then required to complete the two experimental, verbal, computer-based CPT trials, undergoing high-load or low-load distraction (determined by experimental group allocation; see Figure 3.1). For the high-load distraction task, participants were required to count backwards continuously threes (or sevens for participants in group 3 completing trial 2) from 900 at three-second intervals for the duration of the exposure session. For the low-load distraction task, participants were required to count backwards continuously by ones from 900 at three-second intervals. To ensure counting frequency was controlled, a beep would sound at three-second



intervals and the participant would then be required to state the next number in sequence. All participants were instructed to try their hardest not to make any mistakes while counting and were instructed to also keep focused on the verbal CPT trial at the same time.

The two four-minute trials were separated by a short break, before the next set of instructions was provided to the participant. The entire testing session took approximately 25-30 minutes (with actual CPT testing time being a maximum of 12 minutes including practice trials)<sup>17</sup>.

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<sup>17</sup> Four-minute CPT trials were used to ensure a long enough time to detect practice effects (if present) and short enough to ensure the risk of fatigue effects was minimised (Ballard, 2001).

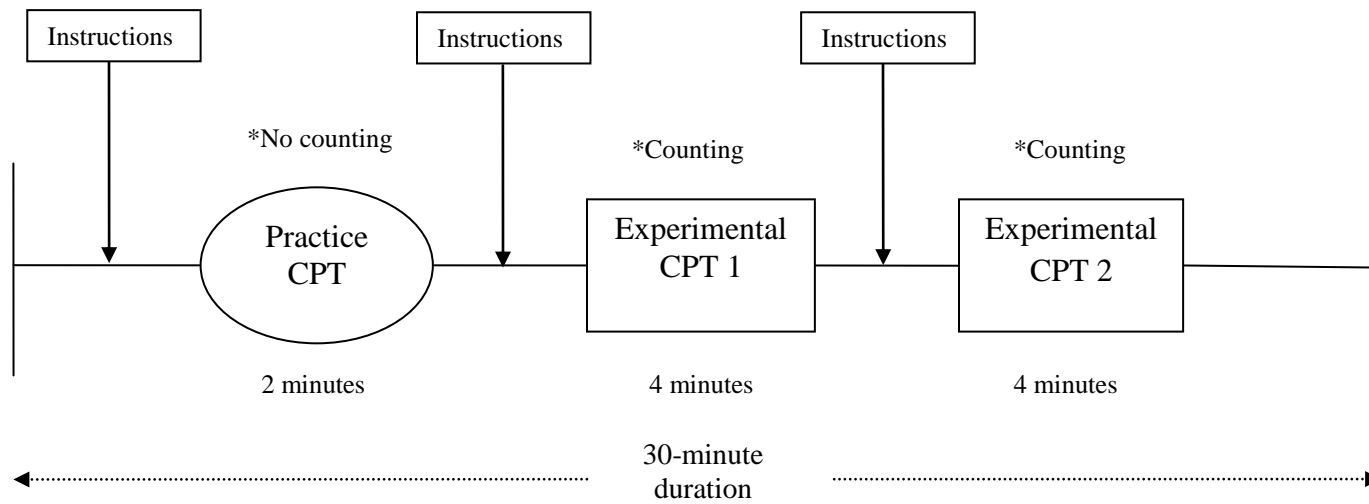


Figure 3.1. Timeline of the experimental procedure outlining practice and experimental CPT trials.

## Results

Data from 22 participants were analysed. The median reaction time (RT) data for each participant, measured in milliseconds (ms), was calculated within each CPT trial. Median RT was selected over mean RT, due to the positively skewed nature of this RT data, and is measured in milliseconds (ms). Hit rate was calculated by dividing the number of hits by 24. A perfect performance with regard to hit rate is expressed as 1.0. False alarm rate was calculated by dividing the number of false alarms by 96. Perfect performance with regard to false alarms is expressed as 0.00 (i.e., participant would have to respond to zero false alarms). Prior to analysis, the data were screened for outliers by assessing the standardised scores for each variable. No score exceeded the cut-off of  $|Z| > 2.5$ , so no further action was required. Frequencies on all variables were normally distributed. An alpha level of  $p=.05$  was used to determine statistical significance.

Separate paired samples *t*-tests were conducted for each of the three groups (see Table 3.1). Superior performance was evidenced by lower reaction time scores, higher hit rates, and lower false alarms.

### **Redefining the Function of Counting Errors in the Context of Study 2**

Prior to reporting the findings of Study 2, it is important to briefly outline the slight shift in the function of counting errors within the context of the verbal CPT program. In Study 1, recording participants' counting error rates provided a means of

ensuring that participants would be more likely to take the counting task seriously, and also ensured irregular counting patterns could be ruled out as a possible explanation for any group differences on the dependent variables (i.e., the integrity of the experimental manipulation could be checked). In addition, counting error rates provided an indication (in as much as is possible) of how much or how little a counting task loaded on working memory. It was assumed that the more difficult the counting task, the more demand would be placed on participants' working memory, and ultimately, the more counting errors would occur. Due to some of the hypothesised practice effects at play in Study 1 and the suspected compromising of the experimental manipulation, it was clear that a more reliable index of working memory load (and distractibility) was needed. With regard to Study 2, the CPT program calculated a hit rate index which formed the primary means of establishing the level of working memory load. The counting error rate is still important, however is not considered the primary indicator of working memory load in Study 2.

### **Aim 1: Establishing whether practice effects were at play in Study 1.**

The first aim of Study 2 was to simulate the counting tasks from Study 1 using the CPT program, to provide data on the relative working memory load of these tasks. The first part of this aim was to establish whether practice effects were indeed likely to be at play in Study 1 for participants in group 2 (who underwent high-load distraction during both exposure sessions). To test this hypothesis, paired samples *t*-tests were used for participants in group 1 (who simulated group 2's high-load counting tasks from Study 1) and data pertaining to hit rate, reaction time, false alarm rate and counting

errors were analysed. As predicted, participants' hit rate significantly increased from time 1 ( $M = .74$ ;  $SD = .22$ ) to time 2 ( $M = .83$ ;  $SD = .16$ ), indicating that participants became significantly better at the task at time 2 and suggesting that the working memory load required to complete the task significantly reduced at time 2,  $t(7) = -2.57, p = .037$ .

Also, as predicted (and as seen in Study 1), participants' counting errors significantly reduced from time 1 ( $M = 3.00$ ;  $SD = 3.16$ ) to time 2 ( $M = 1.50$ ;  $SD = 2.73$ ). This result, in conjunction with the significant hit rate finding, offers further support that the high-load task at time 2 used significantly less working memory than at time 1,  $t(7) = 2.81, p = .026$ .

Contrary to prediction, participants' reaction time did not significantly improve from time 1 ( $M = 829.45$ ;  $SD = 183.15$ ) to time 2 ( $M = 799.300$ ;  $SD = 120.31$ ;  $t(7) = 1.02, p = ns$ ), nor did participants' false alarm (non-target) rates from time 1 ( $M = .035$ ;  $SD = .029$ ) to time 2 ( $M = .024$ ;  $SD = .018$ ;  $t(7) = 1.43, p = ns$ ). In keeping with this finding, participants' false alarm (filler) rates also did not differ from time 1 ( $M = .004$ ;  $SD = .004$ ) to time 2 ( $M = .004$ ;  $SD = .003$ ;  $t(7) = -.01, p = ns$ ).

The second part of aim 1 was to confirm that practice effects were not at play for participants in Study 1 allocated to group 4 (who underwent low-load distraction during both exposures). To test this hypothesis, paired samples  $t$ -tests were used for participants in group 2 (who simulated group 4's low-load counting tasks from Study 1) and data pertaining to hit rate, reaction time, false alarm rate and counting errors were

analysed. As predicted, participants' hit rate did not significantly differ from time 1 ( $M = .74$ ;  $SD = .21$ ) to time 2 ( $M = .80$ ;  $SD = .23$ ), indicating that the working memory load demanded by this task held stable over time,  $t(6) = -1.75$ ,  $p = ns$ .

Also as predicted (and as seen in Study 1), participants' counting errors did not significantly differ from time 1 ( $M = 3.71$ ;  $SD = 3.59$ ) to time 2 ( $M = 2.43$ ;  $SD = 2.64$ ). This result, in conjunction with the non-significant hit rate finding, offers further support that the low-load task at time 2 demanded a similar level working memory as at time 1,  $t(6) = 1.89$ ,  $p = ns$ .

Also as predicted, participants' reaction time did not significantly differ from time 1 ( $M = .898.33$ ;  $SD = 242.81$ ) to time 2 ( $M = 818.34$ ;  $SD = 140.56$ ;  $t(6) = 1.53$ ,  $p = ns$ ), nor did participants' false alarm (non-target) rates from time 1 ( $M = .07$ ;  $SD = .04$ ) to time 2 ( $M = .06$ ;  $SD = .06$ ;  $t(6) = .260$ ,  $p = ns$ ). In keeping with this finding, participants' false alarm (filler) rates also did not differ from time 1 ( $M = .02$ ;  $SD = .02$ ) to time 2 ( $M = .01$ ;  $SD = .03$ ;  $t(6) = -.85$ ,  $p = ns$ ). These findings offer additional support that the low-load task demanded a similar level of working memory over time.

### **Aim 2: Operationalising new distraction tasks.**

The second aim of Study 2 was to utilise the findings from the practice effects manipulation a) to determine whether developing new counting tasks was necessary to replace those used in Study 1 and, if so, b) to operationalise the new counting task/s to ensure working memory load and distractibility of the new task is not compromised.

Given that practice effects were only confirmed for group 1 (who simulated group 2's high-load counting tasks from Study 1), only one new counting task needed to be operationalised. Therefore, a third group of participants completed the verbal CPT task while undertaking a slightly different task at time 1 (counting backwards by threes) and at time 2 (counting backwards by sevens). In order to test the stability of working memory load across these two tasks, paired samples *t*-tests were used for participants in group 3 and data pertaining to hit rate, reaction time, false alarm rate and counting errors were analysed. As predicted, participants' hit rate did not significantly decrease from time 1 ( $M = .62$ ;  $SD = .19$ ) to time 2 ( $M = .55$ ;  $SD = .19$ ) with the introduction of the slightly harder counting task at time 2, indicating that participants' working memory load was taxed to a similar degree during both tasks,  $t(6) = 1.19$ ,  $p = ns$ .

Contrary to the prediction that counting error rates would remain relatively stable over time (due to the above-mentioned hit-rate finding, suggesting equal working memory load at time 1 and time 2), counting errors significantly increased from time 1 ( $M = 4.86$ ;  $SD = 4.18$ ) to time 2 ( $M = 7.71$ ;  $SD = 4.15$ ;  $t(6) = -4.51$ ,  $p = .004$ ).

As predicted, participants' reaction time did not significantly deteriorate from time 1 ( $M = 840.19$ ;  $SD = 82.85$ ) to time 2 ( $M = 863.129$ ;  $SD = 197.46$ ;  $t(6) = -.48$ ,  $p = ns$ ), nor was there deterioration of participants' false alarm (non-target) rates from time 1 ( $M = .08$ ;  $SD = .05$ ) to time 2 ( $M = .05$ ;  $SD = .04$ ;  $t(6) = 1.76$ ,  $p = ns$ ). In keeping with this trend, participants' false alarm (filler) rates also did not differ from time 1 ( $M = .02$ ;  $SD = .02$ ) to time 2 ( $M = .01$ ;  $SD = .01$ ;  $t(6) = 1.93$ ,  $p = ns$ ).

## Discussion

The current study aimed a) to assess objectively whether practice effects were present for those participants in Study 1 who repeated the same counting task during both exposure sessions, and b) to operationalise new counting tasks to replace those that were compromised by these practice effects. Firstly, it was predicted that practice effects would exist for participants simulating the high-load counting task used in Study 1 while undergoing the CPT. This hypothesis was supported. Participants allocated to group 1 in the present study (who counted backwards by threes during both trials) demonstrated increased hit rate during trial 2 which, in conjunction with a reduction in counting errors over time, supports the interpretation that participants became better at the counting task across time and indicates that the task demanded less working memory at trial 2 when compared with trial 1. It was also predicted that practice effects would not exist for those participants simulating the low-load counting tasks used in Study 1 while undergoing CPT. This prediction was confirmed. Participants allocated to group 2 in the present study (who counted backwards by ones during both trials) demonstrated no increase in hit rate from trial 1 to trial 2, which, in conjunction with stable counting error rates across trials, supports the prediction that practice effects were not at play for these participants and that working memory load held relatively stable over time.

Finally, given the finding that practice effects did exist for those participants undergoing the high-load distraction during both trials, operationalising a new high-load task was necessary for use in the planned replication study (Study 3). It was predicted that introducing a more difficult counting task at trial 2 (i.e., counting backwards by



sevens) would offset the observed practice effects and result in a more stable working memory load (evidenced in stable hit-rate across both trials). This prediction was confirmed. When participants counted backwards by threes while undergoing the CPT during trial 1 and were then required to count backwards by sevens while undergoing the CPT during trial 2, hit rate did not significantly differ between the two trials, confirming stable working memory load and a superior distracter for use in Study 3. It was also predicted that counting error rates would remain fairly stable from trial 1 to trial 2 for this group. This prediction was not confirmed. If this finding was viewed in isolation (outside of the context of CPT data), it may suggest that working memory load increased during trial 2, indicating that distraction load was not held constant over time. If this was the case, it would render the newly operationalised counting task unusable in the replication study (Study 3). When this finding is viewed in conjunction with hit rate data from the CPT program, however, the non-significant decrease in hit rate (the primary index of working memory load) confirms that distraction load is stable across trials. It is likely, then, that the significant increase observed in counting errors at trial 2 for these participants is more reflective of an increase in the time taken to perform the necessary subtractions for the counting task whilst still attending to the CPT.

Given the difficulty inherent in determining attentional allocation under dual-task conditions (e.g., Low, Leaver, Kramer, Fabiani, & Gratton, 2009), care was taken to instruct participants at the beginning of the experiment to allocate equal attentional resources to both the counting and CPT (“Remember: both the computer task and the counting task are of equal importance so you must try very hard not to make errors in

either component”; see Appendices R and S). In addition, it is known that participants who have been instructed or strongly encouraged to complete a task are more likely to maintain their attention towards it (Levy & Pashler, 2001; Pashler, 2000). This was also taken into consideration with the delivery of the task instructions in the present study (“Finally, it is essential that you don’t make any mistakes while counting. You **MUST** make a lot of effort **NOT** to make any mistakes. If you make mistakes your data may be useless and you may be asked to complete further testing”; see Appendices R and S). Therefore, the non-significant hit rate data, in conjunction with the measures taken to ensure attentional resources were equally split between the two tasks, makes it likely that the significant increase in errors at time 2 reflects nothing more than the increased difficulty of the task without compromising (i.e., taxing unnecessarily heavily) the stable working memory load.

Hit rate served as the primary index of working memory load in the present study and confirmed the predicted performance of experimental groups in terms of distraction load across trials. Counting error rates served as a secondary check of working memory load and, apart from the unexpected performance on this dependent variable for group 3 in the present study, this variable also confirmed the predicted performance of experimental groups with regard to distraction load across trials. Unexpectedly, however, RT data did not reveal the expected differences between trials, in that there were no significant differences for group 1 (counting backwards by threes

during both trials) between CPT trial 1 and CPT trial 2<sup>18</sup>. One possible explanation for this unexpected finding might lie in a comparison between the trials participants underwent in the Johnstone and Page studies (where significant group differences in RT data was found), as opposed to the present study. For instance, in Johnstone and Page's (2007a) study, comparisons were made between visual and verbal versions of the CPT (designed to target the two distinct types of working memory, as defined by Baddeley and Logie, 1999). Participants were required to firstly undergo a "no conversation" condition (i.e., the equivalent of "focusing") whilst completing the CPT, followed by a conversation about the physical features of fruit whilst undergoing CPT, and lastly, engaging in personally relevant conversation whilst undergoing CPT. Additionally, in their final study, Johnstone and Page (2007c) had participants undergo the CPT with no distraction, followed by counting backwards by threes, and lastly, counting backwards by ones. Significant differences in RT were also found in their study, likely due to the distinct nature of each task (Johnstone & Page, 2007c). When compared to the current study that required participants to repeat the same counting task during both CPT trials, it is likely that RT represented an index that was not sensitive enough to detect what may have been only small (non-significant) improvements between trials.

With regard to false alarm data for groups 1 and 2 in the present study, a similar principle may apply. Although it was hypothesised that false alarm rate data from the CPT output would reflect the pattern of results indicated by hit rate data, this prediction

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<sup>18</sup> This pattern did not apply to group 3 in the present study who counted backward by threes during trial 1 and sevens during trial 2, as RT data performed as predicted for this group.

was not confirmed<sup>19</sup>. This finding is not completely unexpected though, when taking into consideration the Johnstone and Page (2007a, 2007c) studies, outlined above, in which, despite having participants undergo a series of very different tasks (i.e., no conversation, fruit conversation, personally-relevant conversation, counting backwards by threes, counting backwards by ones) whilst undergoing CPT, no significant differences in false alarm rate data were found. Johnstone and Page (2007a) acknowledged that this was likely due to false alarm rates being known to be more of a measure of impulsivity and sensory discrimination, as opposed to a measure of one's ability to maintain sustained attention (Ballard, 2001).

A limitation of the current study is that the counting-based distraction tasks were operationalised outside of an exposure context and with a non-anxious sample. Given that anxiety is known to strongly orient an individual's attention and has the potential to reduce the capacity to process peripheral (non-threatening) information (Eysenck, 1997; Mogg & Bradley, 2006), it is possible that during exposure (i.e., fear-provoking) conditions, the distraction tasks become slightly less distracting than the CPT data indicates. The orienting response is particularly pertinent for those individuals with higher levels of stimulus-bound fear, and this has been demonstrated with various anxious populations (Wilson & MacLeod, 2003). In addition, no screening process was employed in the current study to attempt to recruit a similarly anxious sample to that which was used in Study 1, or that which will be used in Study 3. Given that an

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<sup>19</sup> This does not apply to group 3 in the present study who counted backward by threes during trial 1 and sevens during trial 2 as false alarm rate data performed as predicted for this group.

individual's anxiety level has been noted as one of the participant-relevant factors that can influence CPT performance (Ballard, 2001), future studies attempting to operationalise distraction tasks for use with anxious samples should aim to use samples with a similar level of anxiety to the participant population targeted for exposure-based studies.

This study confirmed the likely presence of practice effects for participants in Study 1 who underwent high-load distraction tasks during both exposure sessions, and ruled out practice effects for participants in Study 1 who underwent the low-load distraction tasks during both exposure sessions. In addition, the current study successfully operationalised a replacement counting-based distraction task for those undergoing high-load distraction during both exposure sessions. The use of a CPT to operationalise distraction in terms of working memory for use with anxious participants in an exposure-based context is a relatively new concept and, to the author's knowledge, has only otherwise been done by Johnstone and Page (2007a, 2007c). Despite the lack of screening procedures to obtain an anxious sample, operationalising counting tasks outside of an exposure-based context, and the insensitivity of reaction time and false alarm rate data, the current study has successfully refined the integrity of distraction tasks ready for use in a replication study where the effects of distracted exposure will be further explored.

## **Chapter 4**

### **Study 3**

#### **Further Investigating the Relationship between Distraction-Load and Fear-Level over Time in a Higher Anxiety Sample with Re-operationalised Distraction Tasks.**

The final study of this research program aims to undertake a replication of Study 1 with the integration of some methodological improvements and recruitment of a higher anxiety sample. The first study in this research program demonstrated significant fear reduction under distracted conditions, and showed partial support for an interaction between fear-level and distraction load. Due to suspected practice effects for the experimental groups that underwent the same counting-based distraction task during both exposure sessions, an insensitive behavioural measure of anxiety, and the relatively low-level of stimulus-bound anxiety of the sample used when compared with that of other studies (e.g. Johnstone & Page, 2004, 2007b, 2007c), methodological changes were necessary to undertake a more thorough investigation of distracted exposure.

Study 2 confirmed the presence of likely practice effects for participants in Study 1 who underwent high-load distraction tasks during both exposure sessions, and ruled out practice effects for participants who underwent the low-load distraction tasks during both exposure sessions. In addition, Study 2 successfully operationalised a replacement counting-based distraction task for those undergoing high-load distraction during both exposure sessions. Study 3 will use this replacement distraction task, thereby overcoming one of the methodological problems of Study 1.

Another methodological improvement in the current replication study is the introduction of a screening process to recruit a higher-anxiety sample. In Study 1, it was predicted that group 1 (HL-LL) would experience the greatest reduction in anxiety over time, due to fear level and distraction load being matched in both exposure sessions (as opposed to group 4 where fear level and distraction load were matched in exposure two, but not exposure one). The results of Study 1 indicated that group 1 (HL-LL) unexpectedly performed similarly to that of group 4 (LL-LL) over time, indicating that the relatively higher distraction load in exposure one for group 1 (HL-LL) did not hold strong benefits for that group. As discussed in detail in the discussion section for Study 1, this finding might be explained by the relatively lower level of anxiety for that study, with regard to pre-treatment SUD ratings and pre-treatment FSQ scores, when compared with other studies (Johnstone & Page, 2004, 2007b, 2007c). The disparity between the spider-fearful sample used in Study 1 and the spider-phobic sample used in the Johnstone and Page studies (and the subsequent lower level of stimulus-bound anxiety) could account for the groups in Study 1 not performing as predicted (i.e., group 1 (HL-LL) not experiencing significantly greater anxiety reduction than group 4 (LL-LL)).

The final methodological issue in need of addressing is the insensitivity of the BAT used in Study 1. Traditionally, distraction studies that have shown group differences in SUD ratings have not had these differences generalise to behavioural measures of anxiety (Johnstone & Page, 2007b; Mohlman & Zinbarg, 2000; Penfold & Page, 1999; Rodriguez & Craske, 1995). One reason that has been cited, in an attempt to account for this finding, is that behavioural measures of anxiety have not been

sensitive enough to detect group differences, resulting in ceiling effects, where most participants can complete most of the items on their first attempt (Penfold & Page, 1999). This, in combination with the relatively lower anxiety level of participants in Study 1, makes it more likely that ceiling effects would occur and group differences would not be detected. The BAT used in Study 1 was modelled on that used by Johnstone and Page (2004) which has previously been successful in detecting group differences. However, the BAT did not detect group differences in Study 1. The procedure for altering the BAT to increase its sensitivity for the current replication study is outlined in the method section.

Based on the findings of Study 1, in conjunction with the findings of Johnstone and Page (2004, 2007b, 2007c) and with the above-mentioned methodological alterations in place, the following predictions were made for a group of spider-fearful individuals undergoing varying distraction loads over two exposure sessions:

### **Hypotheses related to Overall Treatment Effectiveness (All Participants)**

(a) It was hypothesised that all participants, regardless of distraction level over time, would demonstrate both within- and between-session reduction in subjective fear and physiological responding (i.e., heart rate, systolic and diastolic blood pressure). In addition, it was predicted that all participants would demonstrate a significant decrease in behavioural avoidance, particularly due to changes in the BAT that were designed to increase the sensitivity of the measure. It was also hypothesised that these treatment



gains would be reflected in the FSQ scores with participants reporting significantly less spider-related fear on this scale at post-treatment than at pre-treatment.

(b) It was also hypothesised that activation of physiological and subjective anxiety would occur for all groups. Despite Foa and Kozak's (1986, 1998) prediction that activation of the fear network will not occur under distracted conditions, other research disagrees by strongly suggesting that animal fears represent tight-knit fear structures that require little match between the stimulus (spider) and the representation in memory to allow activation (Öhman et al., 2001).<sup>20</sup>

### **Hypotheses related to the Interaction between Fear Level and Distraction Load (Specific to Experimental Condition)**

(c) In light of the introduction of a screening procedure to recruit a higher-anxiety sample, (and in keeping with the predictions of Study 1), it was hypothesised that participants who underwent the high-load distraction condition in the initial exposure session, followed by the low-load distraction condition in the second exposure session (group 1: HL-LL), would experience the greatest anxiety reduction (as evidenced by subjective, physiological, and behavioural reductions in anxiety), since anxiety would be relatively higher in the first exposure session and relatively lower in the second. Essentially, distraction load and anxiety level would be matched throughout the treatment process which, based on the Johnstone and Page (2004, 2007b, 2007c), studies is hypothesised to provide the optimal conditions for fear reduction under

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<sup>20</sup> Also, other studies investigating the effect of distraction during exposure (e.g. Johnstone & Page, 2004, 2007b, 2007c) have demonstrated activation of the fear network from baseline under distracted conditions.

distracted conditions. It was also predicted that group 1 would demonstrate greater spider-related fear reduction (pre- to post-treatment) on the FSQ than all other groups.

(d) It was also predicted that those who underwent the low-distraction condition in the initial exposure session, followed by the high-distraction condition (group 3: LL-HL), would experience the least anxiety reduction, since results of previous studies indicate that when anxiety is relatively high (as one would expect it to be in the initial exposure session), people tend not to benefit from lower levels of distraction. And, as anxiety levels become lower, (as one would expect to occur in the second exposure session), people tend not to benefit from higher levels of distraction (Penfold & Page, 1999; Johnstone & Page, 2004).

(e) Finally, it was predicted that groups 2 (HL-HL) and 4 (LL-LL) would result in moderate anxiety reduction, specifically, not greater reduction than group 1 but not less reduction than group 3, as distraction load was optimal in only one exposure, but not the other, for both of these groups. These hypotheses can be seen pictorially in Figure 2.1.

## **Method**

### **Participants**

A total of 78 individuals expressed interest in participating in the study. Potential participants were invited to express interest in participating in the study if they responded positively to at least one of the three randomly selected items from the FSQ (Szymanski & O'Donohue, 1995) which indicated at least some level of spider-related fear. Potential participants were also required to score a minimum of 36 (out of a

possible 90) on the FSQ. In addition, potential participants needed to rate both their level of spider-fear and spider-related avoidance as, at least, ‘moderate’ on the ADIS (denoted by a score of at least 4 out of a possible 8 (Brown et al., 1994). A total of 14 individuals were excluded from the study on this basis. No participants withdrew from the study at any time, and the final sample consisted of 64 participants (54 females and 10 males), drawn from the Murdoch University undergraduate psychology subject pool ( $n=44$ ). These participants were offered credit points for their participation. The remaining participants were recruited via on-campus advertisements and by word of mouth ( $n=20$ ). These participants were recruited on a voluntary basis and were not offered any incentive to participate other than being offered an opportunity to reduce their spider-related fear and receive some educational information about spider phobia see Appendices U and V). There were 17 participants in group 1, 16 participants in group 2, 15 participants in group 3, and 16 participants in group 4.

## **Materials**

### **Self-reported fear of spiders.**

#### ***Fear of Spiders Questionnaire (FSQ).***

The FSQ (Szymanski & O'Donohue, 1995) was administered pre-intervention, as part of the screening process mentioned above, and at post-treatment. It is described in detail in Study 1.

#### ***Anxiety Disorders Interview Schedule for DSM-IV (ADIS).***

All participants were required to complete the same adapted version of the Anxiety Disorders Interview Schedule (ADIS; Brown et al., 1994) as used in Study 1.

It was administered at pre-treatment and aided in the screening process as outlined above and also determined whether participants met DSM-IV criteria for specific phobia – animal type (spiders).

***Subjective Units of Distress Scale (SUDS).***

A Subjective Units of Distress Scale (SUDS; Wolpe, 1958) was utilised again for both live-exposure sessions, to ascertain a measure of the participants' subjective levels of distress, and is described in Study 1.

**Behavioural measure of fear of spiders.**

The behavioural measure of anxiety was identical to that used in Study 1. The BAT was administered at pre-treatment, mid-treatment (between the two exposure sessions) and at post-treatment. Instructions were also identical to those used in Study 1, except for the information participants received about the status of the spider (i.e., whether the spider was alive or dead). In the present study, participants were informed that the spider was “completely immobile”, rather than informing them that it was dead (as was done in Study 1), in order to increase the sensitivity of the measure.

**Physiological measures of fear of spiders.**

The physiological measures and the associated measurement procedures were identical to those used in Study 1. Systolic blood pressure (mmHg), diastolic blood pressure (mmHg) and heart rate (pulse/minute) were measured at evenly spaced intervals of 3 minutes and 15 seconds during the two live exposure sessions, using an Omron Automatic Digital Blood Pressure Monitor (model IA1B). As with Study 1,

baseline measures were taken at the end of the session, once all spider-related tasks and associated questionnaires were completed<sup>21</sup>.

### **Phobic stimuli.**

The stimulus utilised for both exposure sessions was a live Black House Spider (*Badumna Insignis*) approximately 3 cm in diameter (consistent with the dimensions of the Black House Spider used in Study 1). The spider was placed in an open glass tray with approximate dimensions of 29cm (L), 19 cm (W), 5cm (H). The stimulus used in the BAT was identical to that used in Study 1.

### **Manipulation checks.**

To determine the success of the experimental manipulation, the same manipulation checks were used as was the case in Study 1. Participants' counting was audio-taped (during the two live exposure sessions) and two random 60-second portions of the recording (one from each live exposure session) were checked for the number of errors. As was the case with Study 1, counting error rates provided a means of ensuring that participants would be more likely to take the counting task seriously, and also ensured we could rule out irregular counting patterns as a possible explanation for any group differences on the dependent variables (i.e., we could check that the integrity of the experimental manipulation was maintained). In addition, counting error rates

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<sup>21</sup> The duration of the entire experimental procedure was 75 minutes in Study 3, as opposed to 90 minutes in Study 1, due to the introduction of the screening procedure where participants completed self-report measures of spider fears prior to attending.

provided an indication (in as much as is possible) of how much or how little a counting task loaded on working memory.

Manipulation checks assessing participants' visual attention to the spider and percentage of spider movement for the two live exposure sessions were identical to those used in Study 1. As was the case with Study 1, participants were also asked to rate how similar the spiders used in the experiment were to the spiders of which they are most afraid.

### **Experimental manipulation.**

Manipulation of cognitive attention was based on the procedure used by Johnstone (2007a) and by integrating the findings of Study 2, which refined and re-operationalised the counting tasks specifically for use in the present study. As was the case in Study 1, a continuous performance task (CPT) was used. For the high-load distraction task, participants were required to continuously count backwards in threes from 900 at three-second intervals for the duration of the exposure session. However, in order to counteract the practice effects observed in Study 1, participants in group 2 (undergoing high-load distraction for both exposure sessions), were required to count backwards by threes from 900 in exposure 1 and by sevens from 900 in exposure 2 (see Table 4.1). For the low-load distraction task, participants were required to count backwards continuously by ones from 900 at three-second intervals. To ensure counting frequency was controlled, a beep would sound at three-second intervals and the participant would then be required to state the next number in sequence. All participants

were instructed to try their hardest not to make any mistakes while counting and were told to keep visually focused on the spider at all times throughout the exposure session.

Table 4.1. *Four (newly operationalised) Experimental Groups used in Study 3*

	Exposure 1	Exposure 2
Group 1	High-load (threes)	Low-load (ones)
Group 2	High-load (threes)	High-load (sevens)
Group 3	Low-load (ones)	High-load (threes)
Group 4	Low-load (ones)	Low-load (ones)

## Procedure

In order to recruit a higher-anxiety sample than was used in Study 1, a screening process was introduced (see ‘Participants’ for description of screening criteria). Participants were required to complete the pre-treatment FSQ and ADIS online via a secure online website. Those who completed the online questionnaires but were not selected to take part in the study (i.e., their spider-related anxiety was deemed too low) were still offered the opportunity to learn about their fear through pre-prepared educational material (see Appendices U and V) on phobias and how exposure treatment works. They were also given credit points for their participation in this screening process. Those participants who progressed through to the next phase of the study were invited to attend a 75-minute exposure session and were randomly allocated to one of the four experimental conditions prior to their arrival (see Table. 4.1). Once informed consent was confirmed, participants were required to attempt BAT-1, after which the

blood pressure monitor was attached and instructions given for exposure 1. The glass tray containing the spider was then placed in front of the participant, 10 centimetres away from the table edge. Participants were instructed that they needed to view the spider directly (not through the glass edge of the tray) and, therefore, needed to be sitting upright with their face approximately 25 centimetres above the phobic stimulus. Participants were instructed to keep visually focused on the spider at all times. Audio taping of the participants' counting commenced at the same time as the exposure and participants either engaged in a high-load or low-load counting task, depending on the condition to which they had been randomly allocated. Blood pressure, heart rate and SUD ratings were collected at evenly-spaced intervals of 3 minutes and 15 seconds for the 20-minute exposure session. At the end of the 20-minute exposure session, the tray was removed and covered out of sight of the participant and the blood pressure monitor removed. BAT-2 was then attempted, followed by the blood pressure monitor being reattached and instructions read for the second 20-minute live exposure session. BAT-3 was then attempted, followed by the completion of the post-intervention FSQ and self-report manipulation checks. Once all spider-related tasks were complete, participants were encouraged to relax for five minutes while baseline heart-rate and blood pressure measures were taken. Finally, participants were offered the opportunity to ask any questions or raise any concerns and a debrief worksheet was provided. Refer to Figure 4.1 for procedure-timeline.



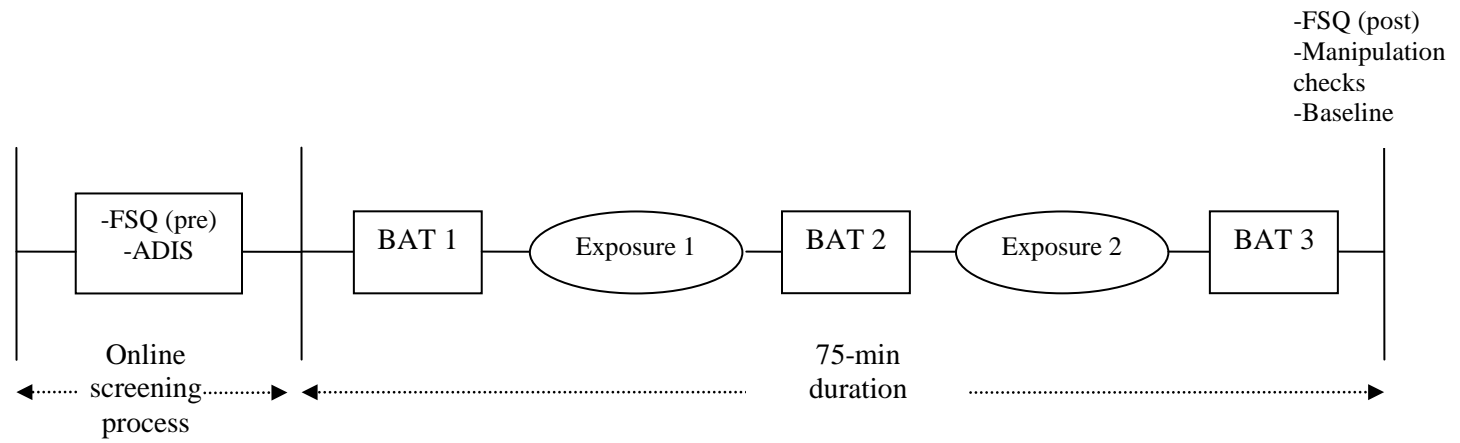


Figure 4.1. Timeline of the experimental procedure outlining questionnaire administration, BAT, and exposure sequence.

## Results

Data from 60 participants were analysed. As with Study 1, variables within each condition with standardised scores of greater than ( $|Z| > 2.5$ ) were considered outliers. These scores were replaced with the next most extreme score for that distribution (Field, 2005; Tabachnick & Fidell, 1996). Of the original 64 participants who passed the initial screening process, four cases were excluded from analysis due to participants rating the spiders used in the experiment as “not at all” like the ones they fear. Participants with standardised scores of  $\leq -2.06$  (or raw scores of 0 or 1 on the 10-point Likert scale) were excluded from the study (just as they were in Study 1) as their level of spider-related fear was not considered to be typical of, or relevant to, the population of subjects of interest. Assumptions of ANOVA were met. Unless otherwise indicated, all  $F$  values reported use the more conservative Greenhouse-Geisser correction where Mauchley’s test of sphericity has been violated. The final sample used for analysis contained 60 participants. An alpha level of  $p=.05$  was used to determine statistical significance.

### Success of Screening Procedure Introduced in Study 3

Before reporting the results of Study 3, it is important to determine whether the screening process introduced in Study 3 was successful (i.e., recruited a significantly higher anxiety sample than Study 1). Pre-treatment data from Study 1 were compared with that of pre-treatment data from Study 3 to determine the success of the screening process (see Table 4.2).

Table 4.2.

*Mean (+SE) of Pre-treatment FSQ (+subscales) Scores, SUD Scores and BAT Steps achieved for Study 1 and Study 3*

Measure	Time		
	Study 1 (n=63)	Study 3 (n=60)	Significant Increase in Anxiety Achieved?
FSQ (Total)			
	49.56 (19.96)	61.40 (14.51)	YES $t(113.25) = -3.78, p < .001$
FSQ (Subscale 1)			
	24.37 (10.54)	29.70 (7.71)	YES $t(113.57) = -3.22, p = .002$
FSQ (Subscale 2)			
	25.19 (10.53)	31.70 (8.06)	YES $t(121) = -3.84, p < .001$
SUDs			
	4.38 (2.45)	5.73 (1.81)	YES $t(114.07) = -3.49, p < .001$
BAT			
	9.05 (1.60)	7.15 (2.99)	YES $t(89.27) = 4.36, p < .001$

*Note:* Values in parenthesis represent the standard error of the mean.

Data considered relevant to ensuring an increase in spider-related anxiety were pre-treatment FSQ scores (total and subscale scores), the first SUD measure of exposure 1, and pre-treatment BAT scores<sup>22</sup>. Success of the screening process would be evidenced by significant increases from Study 1 to Study 3 on the FSQ (and subscale scores), and SUD ratings (at the first measurement of exposure 1). Significant decreases would need to be demonstrated in pre-treatment BAT steps from Study 1 to Study 3 also. The screening process was successful in recruiting a higher anxiety sample than Study 1 and the results of the independent samples *t*-tests can be seen in Table 4.2.

### **Manipulation Checks**

**Visual focus on stimuli (looking %) and intensity of exposure (spider movement %).**

As indicated in Table 4.3, there were no group differences on self-reported estimates of the percentage of time participants spent looking at the spider during both exposure sessions,  $F(3,56) = .895$ ,  $p = ns$ ,  $\eta^2 = .05$ . The absence of group differences on this measure supports the assumption that high- or low-load distraction tasks do not interfere with the degree of visual attention towards the phobic stimulus.

There were also no group differences on self-reported estimates of the percentage of time the spider was moving during each exposure session,  $F(3,56) = .703$ ,  $p = ns$ ,  $\eta^2 = .04$ . This supports the assumption that exposure characteristics that

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<sup>22</sup> In addition, although the aim was not to test a clinical sample, it is worth noting that 33% ( $n=20$ ) of participants met criteria for specific phobia – animal type in Study 3, as opposed to 25% ( $n=16$ ) in Study 1 (as assessed by the ADIS).

influence anxiety reduction (i.e., intensity of exposure) were equal between the conditions.

Table 4.3

*Mean Scores for the Four Experimental Conditions at Pre-treatment for each of the Manipulation checks*

Measure	Condition	Time	
		Exposure-1	Exposure-2
Look (%)	Group 1	90.71 (2.29)	91.47 (2.82)
	Group 2	89.44 (2.36)	84.56 (2.91)
	Group 3	94.85 (2.62)	88.31 (3.23)
	Group 4	92.07 (2.52)	90.43 (3.10)
Move (%)	Group 1	3.41 (1.71)	2.88 (1.45)
	Group 2	3.13 (1.76)	3.25 (1.49)
	Group 3	4.92 (1.95)	3.62 (1.65)
	Group 4	4.86 (1.88)	6.29 (1.59)

*Note:* Values in parentheses represent the standard error of the mean.

### **Perceived status of spider used in the BAT exposure hierarchy.**

As participants were not provided with specific information about the status of the spider used in the BAT exposure hierarchy, a check was included that required participants to indicate (at the end of the experiment) whether they thought the spider was dead or alive. There were no group differences on this measure, supporting the assumption that perceived status of the spider was equal between conditions,  $\chi^2 (3, N = 63) = .40, p = .94$ .

### Counting errors.

As predicted, a significant difference existed between groups on the average number of counting errors, as evidenced by a main effect of group,  $F(3,56) = 6.77$ ,  $p = .001$ ,  $\eta^2 = .27$ . Also as predicted, and as seen in Figure 4.2, group interacted significantly with exposure session, indicating the rate of counting errors over time was different for each group,  $F(3,56) = 17.85$ ,  $p < .001$ ,  $\eta^2 = .49$ . Also as predicted, a main effect of time existed, indicating that regardless of group (and associated distraction load), counting errors tended to increase over time (exposure 1:  $M = 2.13$ ; exposure 2:  $M = 2.93$ ;  $F(1,56) = 5.14$ ,  $p = .027$ ,  $\eta^2 = .08$ ). This finding was consistent with the performance of group 3 in Study 2 who underwent HL (counting backwards by threes) followed by HL (counting backwards by sevens) during the operationalising process<sup>23</sup>. Regardless, further analyses were conducted in an attempt to determine whether the increased difficulty of group 2's [HL(3) HL(7)] new counting task accounted for this main effect of time.

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<sup>23</sup> A significant increase in counting errors occurred for this group from time 1 to time 2, despite working memory load holding stable over time, as evidenced by hit rate data in Study 2.

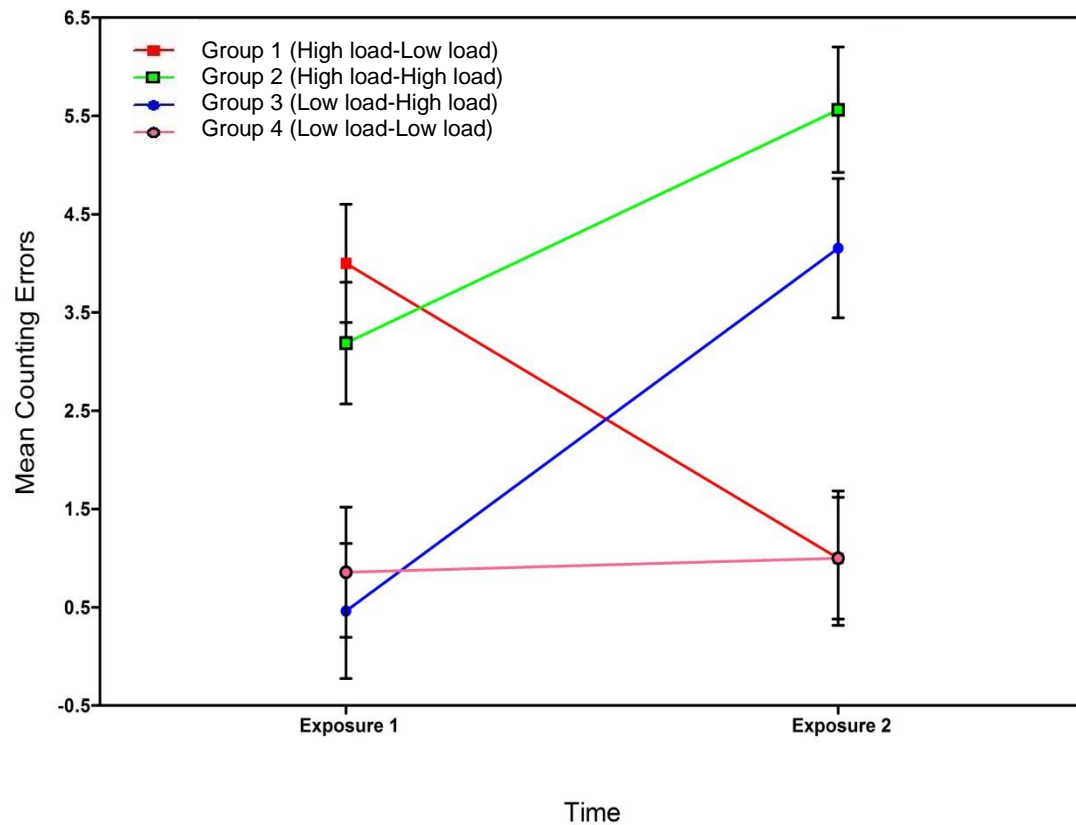


Figure 4.2. Mean number of counting errors (+SE) at exposure 1 and exposure 2 for each group

As predicted, for participants in group 1, who underwent high-load distraction during exposure 1 followed by low-load distraction during exposure 2, the number of counting errors significantly reduced from time 1 ( $M = 4.00$ ;  $SD = 3.102$ ) to time 2 ( $M = 1.00$ ;  $SD = 1.54$ ;  $t(16) = 5.05$ ,  $p < .001$ ). This finding is consistent with the interpretation that the distraction task at time 1 required significantly more working memory than at time 2, indicating that the distraction task was successfully operationalised.

Also as predicted, for participants in group 3, who underwent low-load distraction during exposure 1 followed by high-load distraction during exposure 2, the number of counting errors significantly increased from time 1 ( $M = .46$ ;  $SD = .877$ ) to time 2 ( $M = 4.15$ ;  $SD = 2.44$ ;  $t(12) = -4.90$ ,  $p < .001$ ). This finding is consistent with the interpretation that the distraction task at time 1 required significantly less working memory than at time 2, suggesting successful operationalising of this distraction task.

Again as predicted, for participants in group 4, who underwent low-load distraction during both exposure sessions, the number of counting errors did not significantly differ from time 1 ( $M = .86$ ;  $SD = 1.46$ ) to time 2 ( $M = 1.00$ ;  $SD = 1.62$ ;  $t(13) = -.263$ ,  $p = ns$ ), consistent with the interpretation that the distraction task at time 1 demanded the same amount of working memory at time 2 and that distraction load was held fairly stable over time.

After observing the counting error increase in Study 2 of the group that underwent HL (threes) at time 1 followed by HL (sevens) at time 2, it was predicted that this same pattern would occur for participants in group 2 of the present study. As expected, for participants in group 2 (HL (threes) followed by HL (sevens)), the number of counting errors significantly increased from time 1 ( $M = 3.19$ ;  $SD = 3.19$ ) to time 2 ( $M = 5.56$ ;  $SD = 3.85$ ;  $t(15) = -2.76$ ,  $p = .015$ ). This finding appears to indicate that working memory load did not hold stable across both exposure sessions. However, when this finding is viewed in conjunction with the hit rate data from Study 2 (that confirmed stable working memory load across both trials), it is likely that the significant



increase in errors at time 2 merely reflects the increased difficulty of the task, without compromising (i.e., taxing unnecessarily heavily) the stable working memory load.

*Counting error stability for high-load and low-load tasks.*

As with Study 1, it was important to determine that the counting error rate (and associated working memory load) held stable whenever a participant was undergoing high- or low-load distraction, regardless of their group allocation. For instance, with regard to high-load distraction, participants in group 1, who underwent high-load distraction at time 1, should be distracted to an equal extent to those participants in group 3, who underwent high-load distraction at time 2. Those participants in group 2 should also have been equally distracted at time 1 as these above-mentioned groups<sup>24</sup>. In order to test this, a one-way between-groups ANOVA was conducted on the following data (see Figure 4.3). As predicted, whenever participants were undergoing high-load distraction (irrespective of group or time), the rate of counting errors did not significantly differ, indicating that the high-load distracter imposed an equal load on these participants' working memory  $F(2, 43) = .47, p = ns, \eta^2 = .02$ .

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<sup>24</sup> Participants in group 2, undergoing HL distraction at exposure 2, are excluded from this discussion due to the artificially high counting errors at time 2, despite hit-rate data (from Study 2) suggesting stable working memory load.




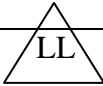
Group	Exposure 1 Distracter	Exposure 2 Distracter
1	HL	LL
2	HL	HL
3	LL	HL
4	LL	LL

*Note:* Circled areas represent data that was included in the one-way ANOVA

*Figure.4.3.* Participants used in one-way ANOVA to determine counting error stability for high-load distracter task.

Similarly, with regard to low-load distraction, participants in group 1 who underwent low-load distraction at time 2 should be distracted to a similar extent to those participants in group 3 who underwent low-load distraction at time 1. Those participants in group 4 should also have been distracted to a similar extent at time 1 (and time 2) as the above-mentioned groups. In order to test this, two separate one-way between-groups ANOVAs were conducted on the following data (see Figure 4.4)<sup>25</sup>. As predicted, whenever participants were undergoing low-load distraction (irrespective of group or time), the rate of counting errors did not significantly differ, indicating that the low-load distracter loaded equally on these participants' working memory (Analysis 1;  $F(2, 41) = .61, p = ns, \eta^2 = .03$ ; Analysis 2;  $F(2, 41) = .67, p = ns, \eta^2 = .03$ ).

<sup>25</sup> Two separate between-groups ANOVAs were conducted (as opposed to one) to prevent participants in group 4 having their exposure 1 data compared with their exposure 2 data in a within-groups analysis.

Group	Exposure 1 Distracter	Exposure 2 Distracter
1	HL	
2	HL	HL
3		HL
4		

*Note:* Circles denote data used in analysis 1, triangles denote data used in analysis 2.

*Figure.4.4.* Participants used in two separate one-way ANOVAs to determine counting error stability for low-load distracter task.

### Dependent Variables Pre-Treatment

As was the case with Study 1, there were no significant group differences on any dependent variable at pre-treatment (see Table 4.4 for physiological results, and Table 4.5 for results relating to self-reported spider-fear ratings). Additionally, there were no significant group differences at pre-treatment in participants' self-reported subjective anxiety ratings,  $F(3,56) = .361$ ,  $p = ns$ ,  $\eta^2 = .02$ , nor were there significant group differences at pre-treatment for the behavioural approach task (BAT;  $F(3,56) = 2.24$ ,  $p = ns$ ,  $\eta^2 = .11$ ).

### Fear Activation

As with Study 1, it was a standard prerequisite to determine that fear was activated for all participants, to ensure the effectiveness of exposure therapy. A series of repeated measures ANOVAs were conducted to establish whether physiological activation from baseline occurred for heart rate, systolic blood pressure, and diastolic blood pressure. All groups experienced this activation from their average baseline

measure to the first measure taken in exposure session 1, as evidenced by the main effects of time for heart rate,  $F(1, 56) = 148.56, p < .001, \eta^2 = .73$ , systolic blood pressure,  $F(1, 56) = 50.92, p < .001, \eta^2 = 0.48$ , and diastolic blood pressure,  $F(1, 56) = 22.08, p < .001, \eta^2 = 0.28$ . Groups did not significantly differ in their degree of activation. There were also no significant group differences with regard to the activation of subjective fear in the initial minute of exposure session 1,  $F(3, 56) = .361, p = ns, \eta^2 = 0.02$ .

### **Analysis of Dependent Variables**

As with Study 1, univariate repeated measures ANOVAs were conducted on each of the dependent variables, assessing change both between and within each exposure session. Specifically, this resulted in an exposure session (exposure 1 and exposure 2) x measurement (7 time points per exposure session) x experimental group (groups 1-4) ANOVA for SUDS, heart rate, and blood pressure as outlined below. *T*-tests were conducted where necessary to further investigate significant findings.

#### **Within-and between-exposure session analysis.**

##### ***SUDS.***

As predicted, there was a significant decrease in subjective anxiety ratings both between,  $F(1, 56) = 58.54, p < .001, \eta^2 = .51$ , and within,  $F(2.32, 130.09) = 83.30, p < .001, \eta^2 = .60$ , the two exposure sessions, indicating that the treatment was effective (see Figure 4.5). Contrary to our prediction, the extent to which this anxiety reduction

occurred from exposure 1 to exposure 2 did not significantly differ between groups,  $F(3,56) = .937, p = ns, \eta^2 = .05$ ).

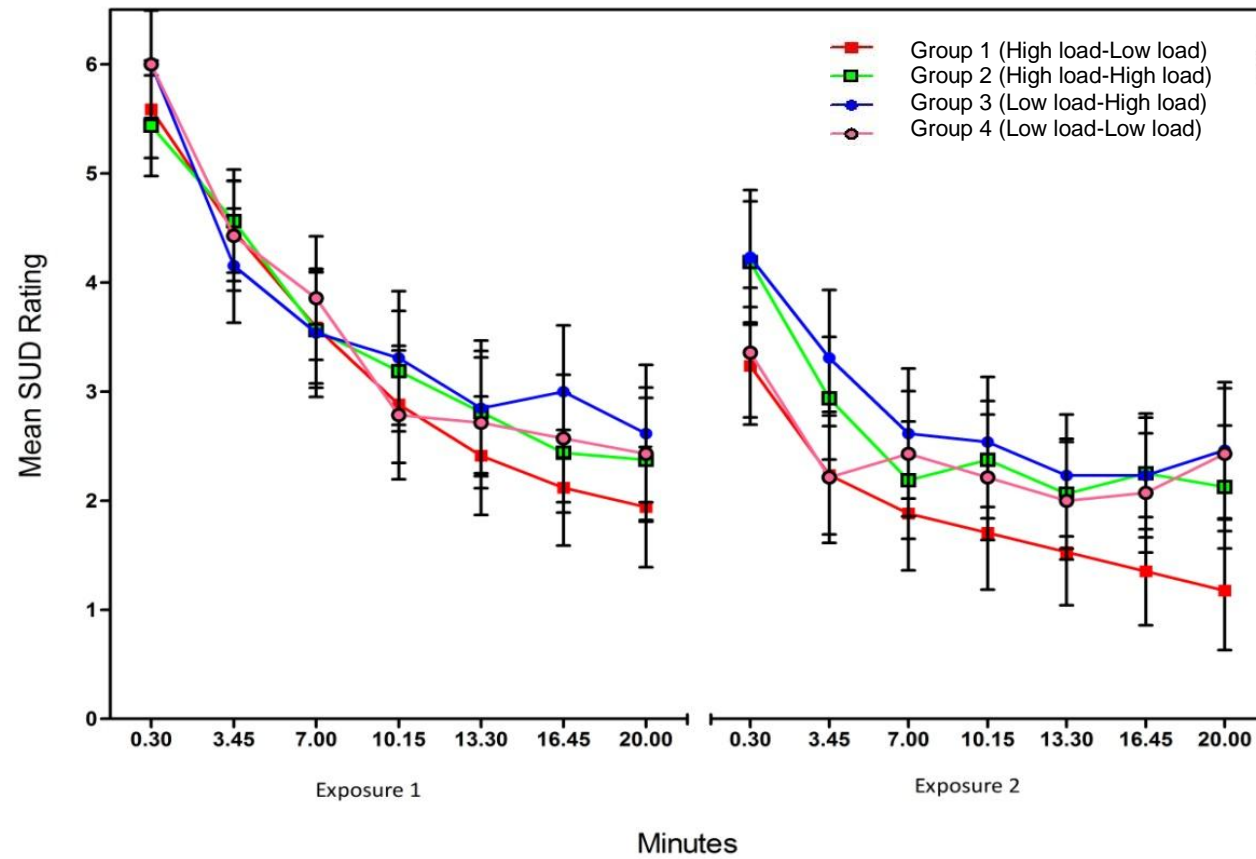
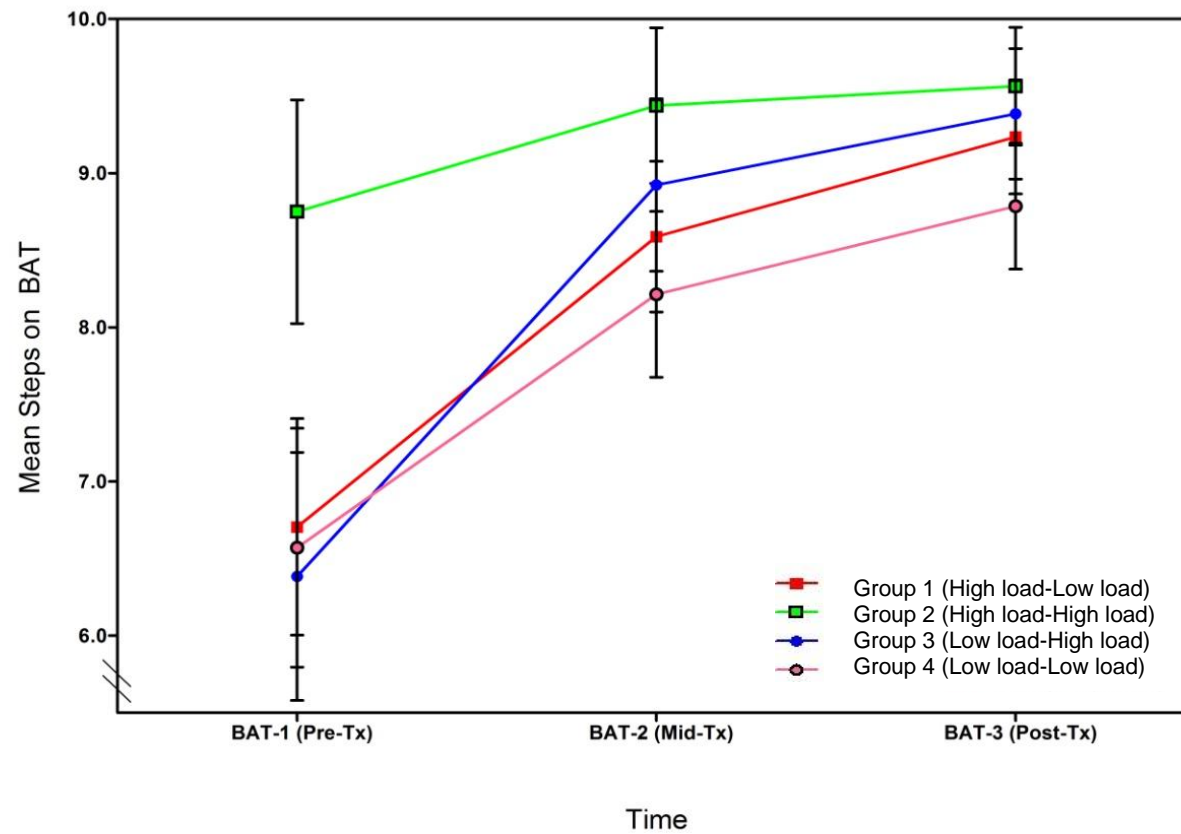


Figure.4.5. Mean SUD ratings (+SE) during exposure sessions for each group.

### ***BAT.***

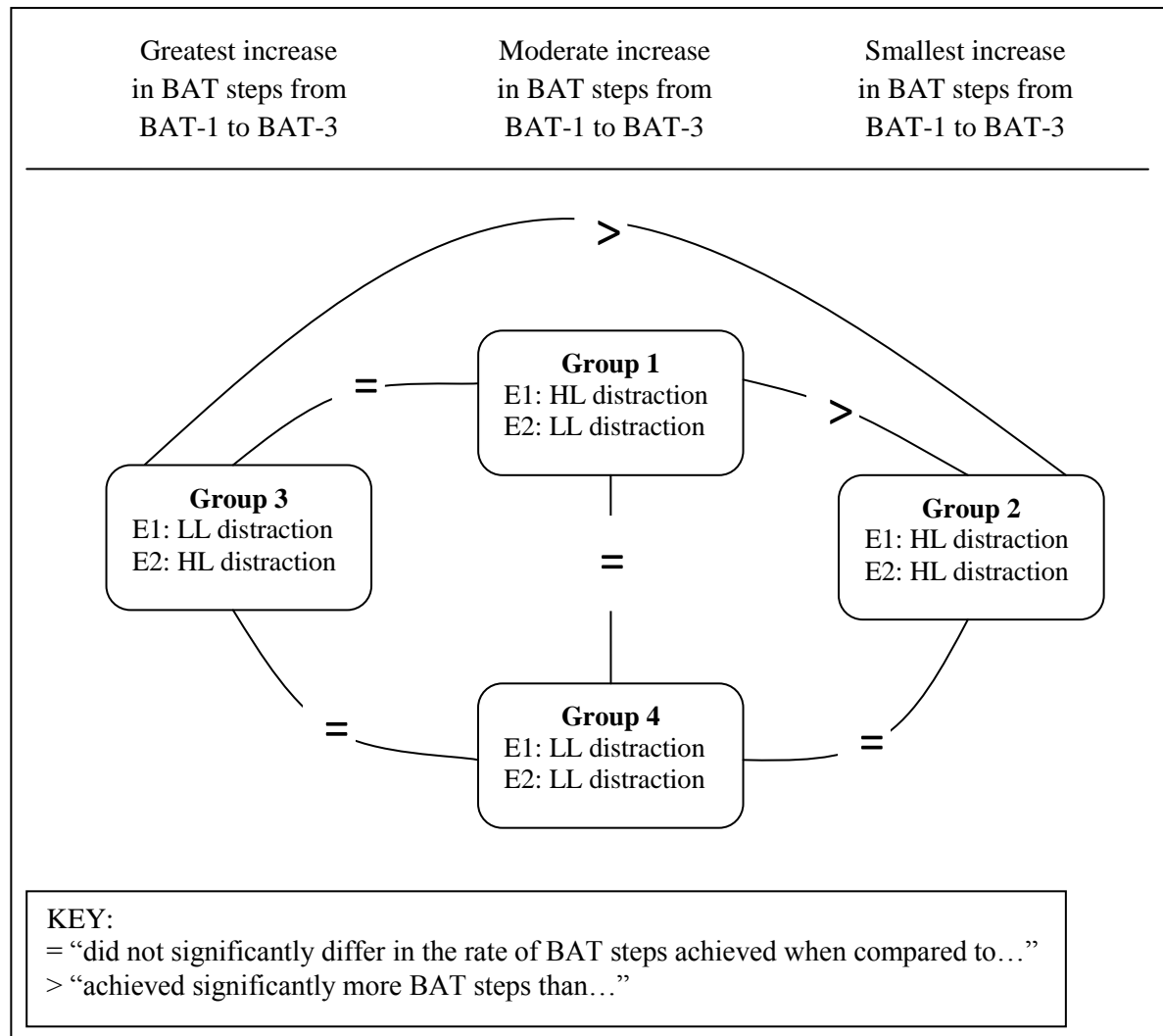
As predicted, there was an overall increase in the number of steps participants achieved on the BAT over time at pre-, mid-, and post-treatment,  $F(1.33, 74.52) = 49.21, p < .001, \eta^2 = .47$ . Also as predicted, experimental groups differed as to the rate at which BAT steps were achieved  $F(4.27, 79.73) = 2.50, p = .046, \eta^2 = .12$ ; see Figure 4.6.

In order to determine the specific groups between which the significant difference existed, further analyses were conducted, comparing each experimental group to the other, using a series of repeated measures ANOVAs. Contrary to our prediction (as can be seen in Figure 4.7), group 3 (LL-HL) had the largest increase in completed BAT steps from BAT-1 (pre-treatment) to BAT-3 (post-treatment), with significantly greater increases than group 2,  $F(1.30, 35.20) = 7.53, p = .006, \eta^2 = .22$ . Group 1 (HL-LL) had the next largest increase in completed BAT steps from BAT-1 (pre-treatment) to BAT-3 (post-treatment), with significantly greater increases than group 2,  $F(1.51, 46.76) = 5.84, p = .010, \eta^2 = .16$ .



*Figure.4.6.* Mean number of steps achieved on the BATs (+SE) in Study 3 at pre, mid, and post-treatment for each group





*Figure 4.7.* The four groups’ anxiety reduction as measured by the rate of BAT steps completed from BAT-1 to BAT-3.

### ***Physiological data.***

#### *Heart rate.*

As predicted, there was a significant overall decrease in heart rate between the two exposure sessions,  $F(1,56) = 43.77, p < .001, \eta^2 = .44$ . Contrary to our prediction, however, the extent to which this reduction occurred from exposure 1 to exposure 2 did not differ between groups,  $F(3,56) = .85, p = ns, \eta^2 = .44$ . Also contrary to our

prediction, there was no significant decrease in heart rate within each of the two exposure sessions,  $F(4.67, 261.47) = 1.46$ ,  $p = ns$ ,  $\eta^2 = .03$ . Means and standard errors of heart rate measurements during baseline, exposure session 1 and exposure session 2 are presented in Table 4.4.

Table 4.4

*Mean Heart Rate Reactivity for the Four Experimental Conditions at Baseline, Session 1, and Session 2.*

Measure	Condition	Time		
		Baseline	Session-1	Session-2
Heart rate <sup>1</sup>	Group 1	72.91 (2.32)	82.25 (2.43)	77.48 (2.22)
	Group 2	71.84 (2.39)	82.45 (2.50)	78.58 (2.29)
	Group 3	68.85 (2.65)	77.14 (2.78)	74.88 (2.54)
	Group 4	69.68 (2.55)	79.05 (2.68)	74.75 (2.45)

*Note:* Means for each session represent estimated marginal means calculated from the seven measures taken in each exposure session. Values in parenthesis represent the standard error of the mean.

<sup>1</sup> At pre-treatment there were no differences between conditions,  $F(3, 56) = .886$ ,  $p = ns$ ,  $\eta^2 = .05$ .

#### *Systolic blood pressure.*

As predicted, there was a significant decrease in systolic blood pressure both between,  $F(1, 56) = 10.89$ ,  $p = .002$ ,  $\eta^2 = .16$  and within,  $F(4.09, 228.95) = 21.81$ ,  $p < .001$ ,  $\eta^2 = .28$ , the two exposure sessions<sup>26</sup>. Also as predicted, the extent to which this reduction in systolic blood pressure occurred from exposure 1 to exposure 2 was not the

<sup>26</sup> At pre-treatment there were no differences between conditions,  $F(3, 56) = .104$ ,  $p = ns$ ,  $\eta^2 = .01$ .

same for each group, as evidenced by a significant interaction of exposure and group,  $F(3,56) = 7.18, p < .001, \eta^2 = .28$ ; see Figure 4.8.

In order to determine the specific groups between which the significant difference existed, further analyses were conducted, comparing each experimental group to the other, using a series of repeated measures ANOVAs. As predicted (and as seen in Figure 4.9), group 1 (HL-LL) had the largest systolic blood pressure reduction from exposure 1 to exposure 2, with significantly greater reductions than group 2 (HL-HL;  $F(1,31) = 5.25, p = .029, \eta^2 = .15$ ), group 3 (LL-HL;  $F(1,28) = 15.34, p = .001, \eta^2 = .35$ ), and group 4 (LL-LL;  $F(1,29) = 11.51, p = .002, \eta^2 = .28$ ).

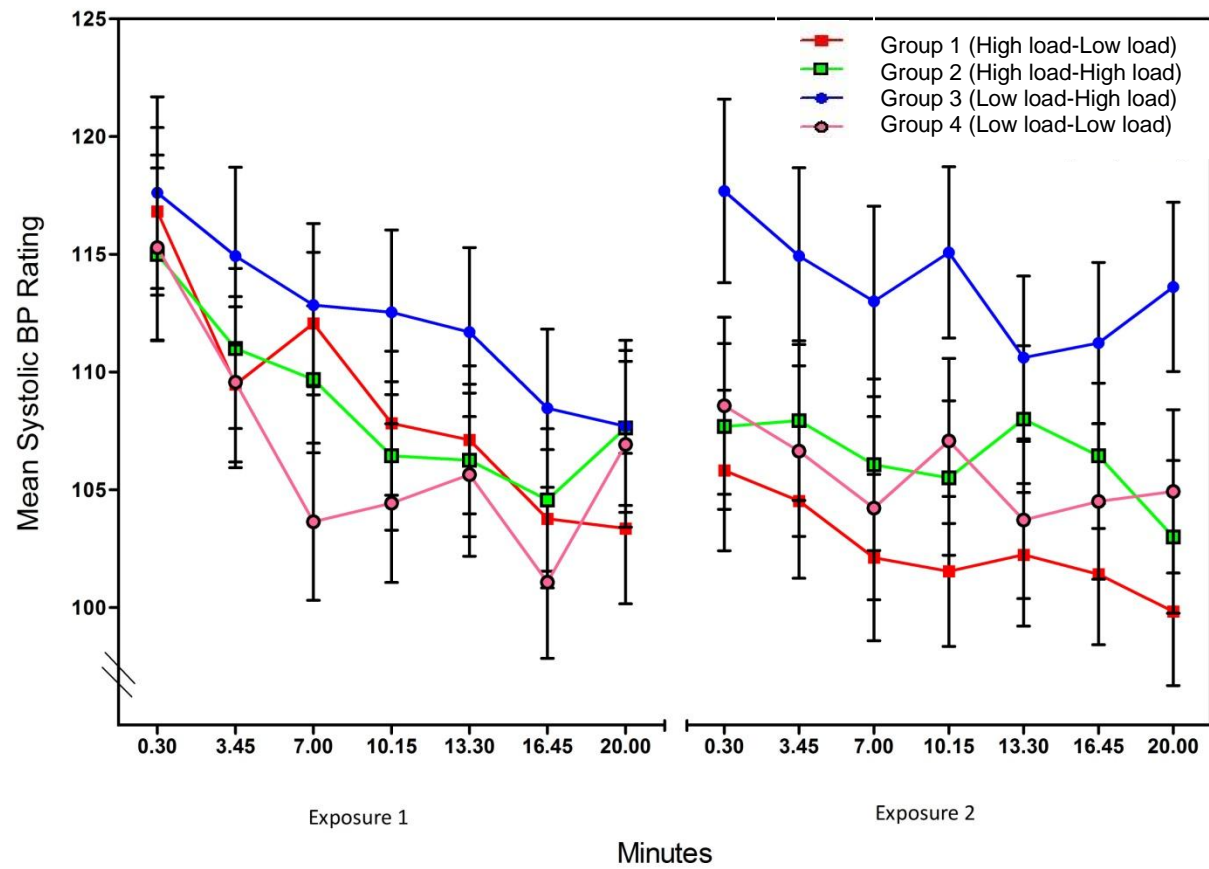
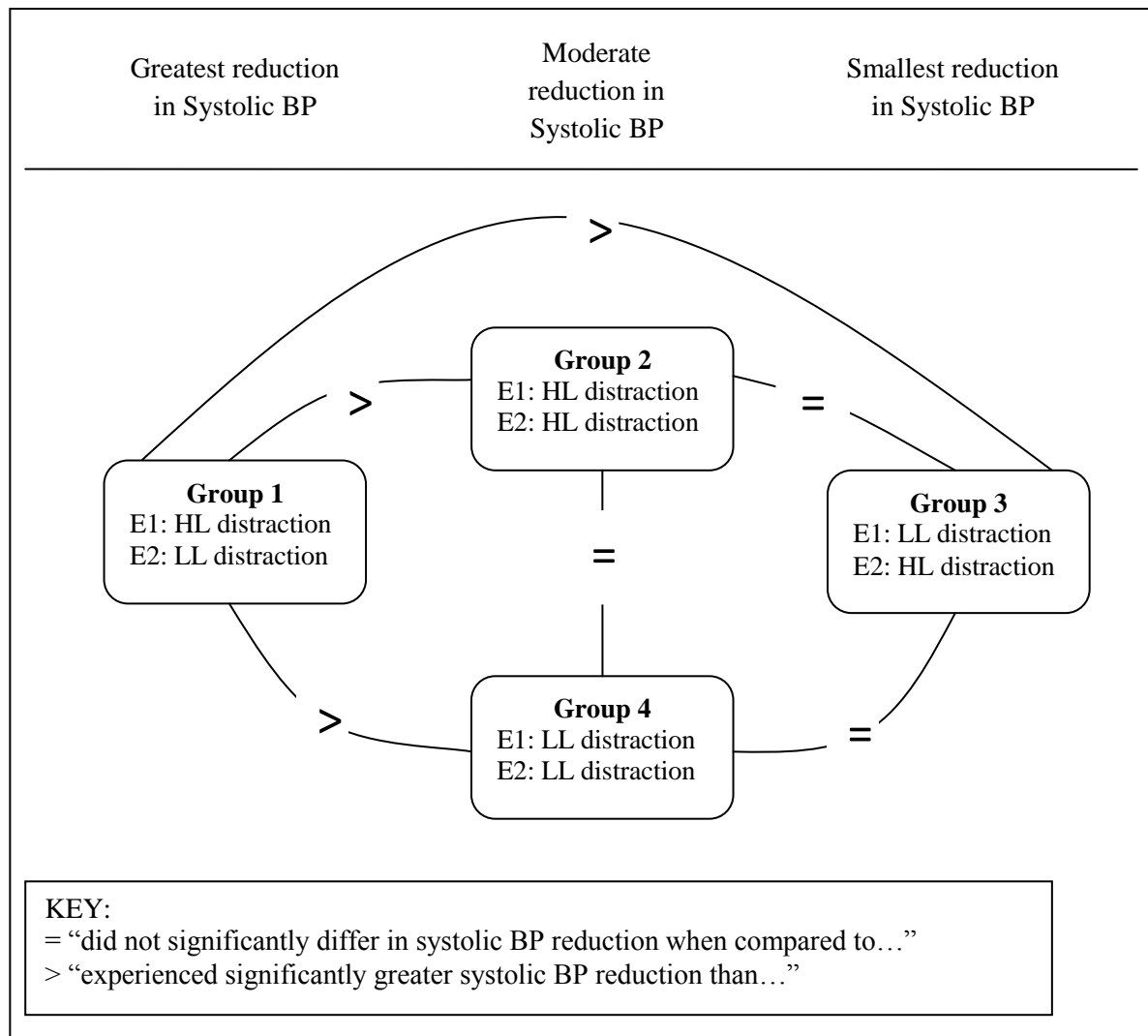


Figure 4.8. Mean systolic blood pressure ratings (+SE) for both exposure sessions for each group.



*Figure 4.9.* The four groups’ systolic blood pressure reduction from exposure 1 to exposure 2.

*Diastolic Blood Pressure.*

As predicted, there was a significant decrease in diastolic blood pressure both between,  $F(1,56) = 8.32, p = .006, \eta^2 = .13$ , and within,  $F(4.04, 226.09) = 6.45, p < .001, \eta^2 = .10$ , the two exposure sessions (see Figure 4.10)<sup>27</sup>. Also as predicted, the extent to which this reduction in diastolic blood pressure occurred from exposure 1 to exposure 2 was not the same for each group, as evidenced by a significant interaction of exposure and group,  $F(3,56) = 4.42, p = .007, \eta^2 = .19$ .

In order to determine the specific groups between which the significant difference existed, further analyses were conducted, comparing each experimental group to the other using a series of repeated measures ANOVAs. As predicted (and as seen in Figure 4.11), group 1 (HL-LL) had the largest reduction in diastolic blood pressure from exposure 1 to exposure 2, with significantly greater reductions than group 4 (LL-LL;  $F(1,29) = 6.87, p = .014, \eta^2 = .19$ ).and group 3 (LL-HL;  $F(1,28) = 7.65, p = .010, \eta^2 = .21$ ).

Group 2 (HL-HL) as also seen in Figure 4.11, had the next largest reduction in diastolic blood pressure, with significantly greater reductions than group 3 (LL-HL;  $F(1,27) = 5.08, p = .032, \eta^2 = .16$ ) but not group 4 (LL LL;  $F(1,28) = 4.20, p = .050, \eta^2 = .13$ ), although it approached significance.

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<sup>27</sup> At pre-treatment there were no differences between conditions,  $F(3, 56) = .613, p = ns, \eta^2 = .03$ .

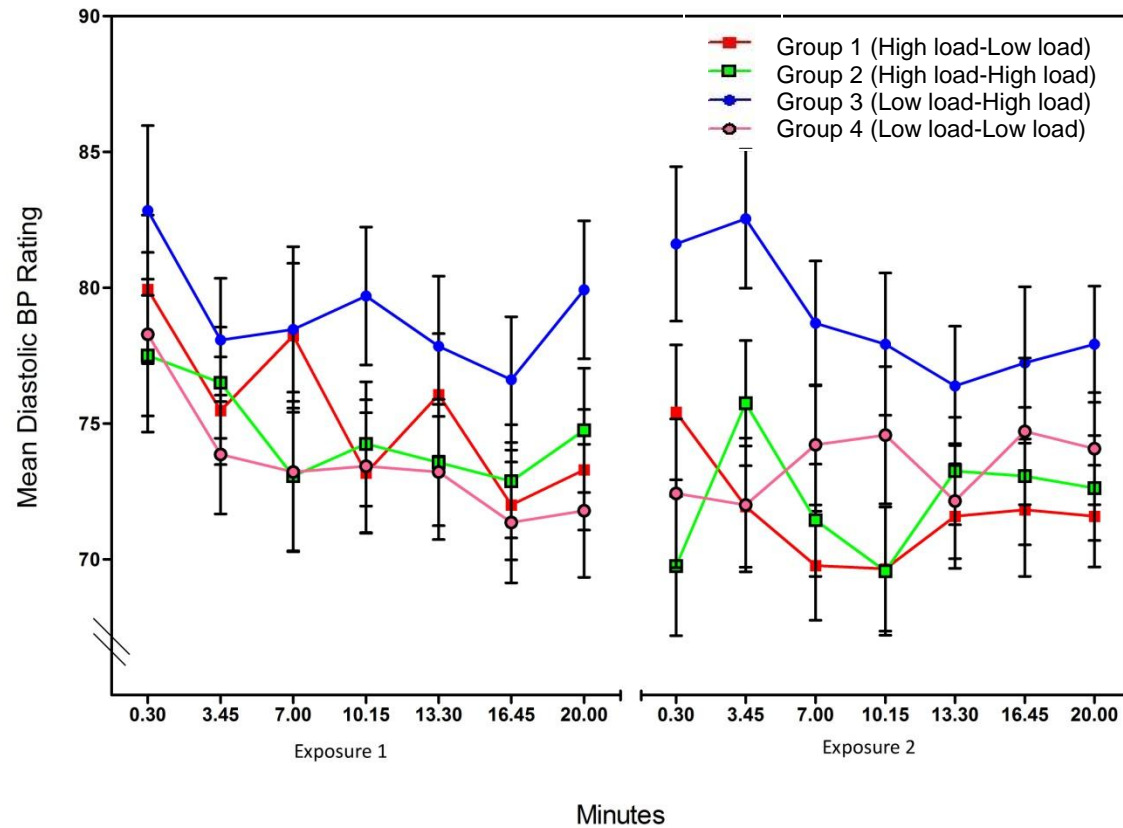
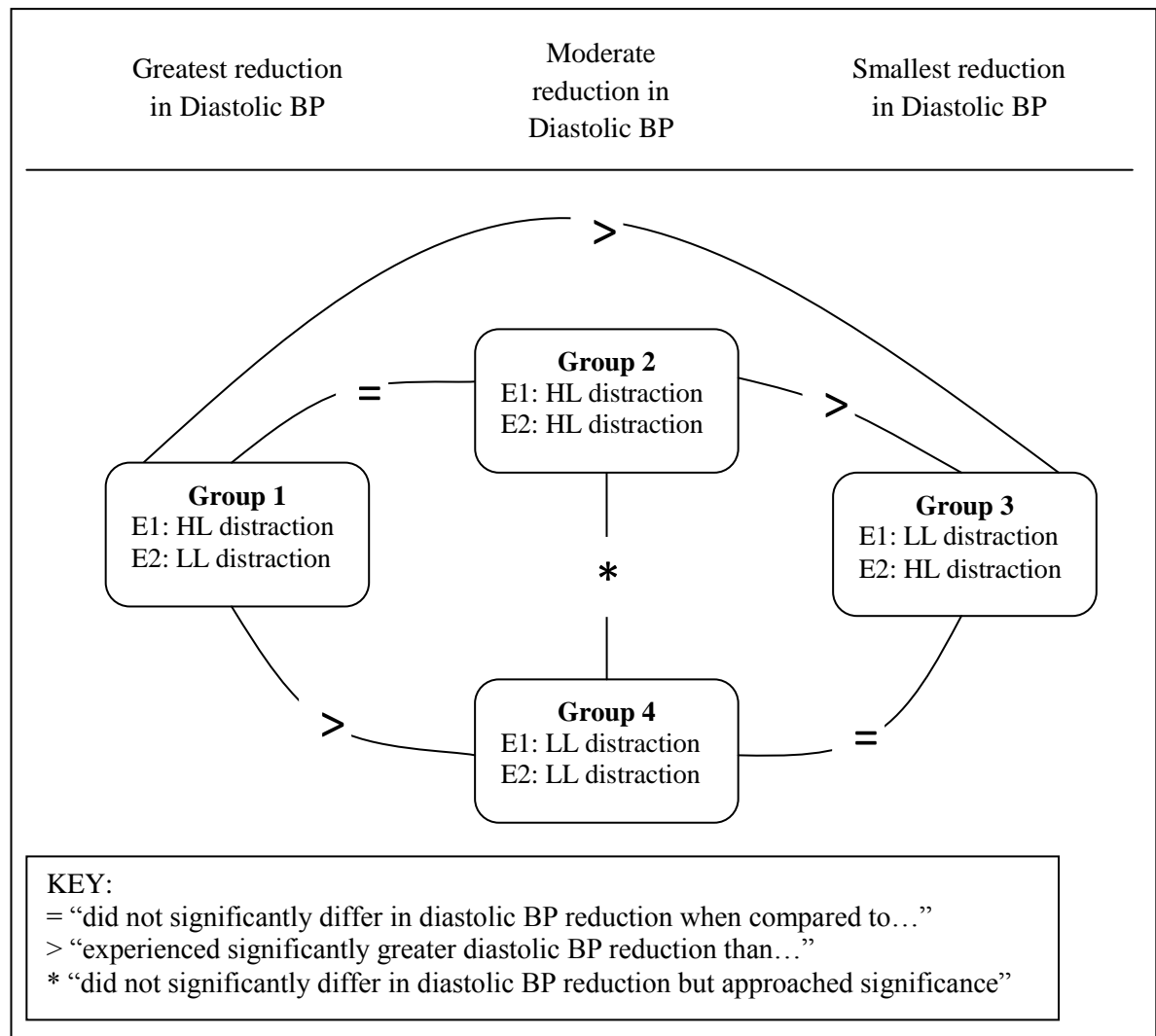


Figure 4.10. Mean diastolic blood pressure ratings (+SE) for both exposure sessions for each group.



*Figure 4.11.* The four groups’ diastolic blood pressure reduction from exposure 1 to exposure 2.



### **Pre-treatment vs. post exposure session 2.**

#### ***FSQ.***

As predicted (and as shown in Table 4.5), there was a significant decrease in participants' total scores on the FSQ from pre-treatment to post-treatment,  $F(1,56) = 56.32, p < .001, \eta^2 = .50$ . Interestingly, and contrary to our prediction, groups did not significantly differ in this reduction on the FSQ from pre-treatment to post-treatment,  $F(3,56) = .54, p = ns, \eta^2 = .03$ .

Again as predicted, there was a significant decrease in scores on FSQ subscale-1 (avoidance/help seeking) from pre-treatment to post-treatment,  $F(1,56) = 67.13, p < .001, \eta^2 = .55$ . Contrary to our prediction, however, groups did not significantly differ in this reduction from pre-treatment to post-treatment,  $F(3,56) = .45, p = ns, \eta^2 = .02$ . This trend also applied to FSQ subscale-2 scores (fear of harm) in that there was a significant decrease from pre-treatment to post-treatment,  $F(1,56) = 33.37, p < .001, \eta^2 = .37$ , but no significant group differences on this reduction from pre-treatment to post-treatment,  $F(3,56) = .55, p = ns, \eta^2 = .03$ .

These results indicate that our exposure treatment was indeed effective, but the group differences observed with the behavioural approach task, diastolic blood pressure and systolic blood pressure over time did not generalise to scores on the FSQ.

Table 4.5  
*Mean FSQ Scores for the Four Experimental Conditions at Pre-treatment and Post-treatment*

Measure	Condition	Time	
		Pre-Treatment	Post-Treatment
FSQ	<i>Total</i> <sup>1</sup>		
	Group 1	57.59 (3.48)	44.06 (4.43)
	Group 2	58.25 (3.59)	47.94 (4.57)
	Group 3	65.54 (3.98)	48.77 (5.07)
	Group 4	65.79 (3.83)	50.79 (4.89)
	<i>Subscale 1</i>	<i>(Avoidance/Help Seeking)</i> <sup>2</sup>	
	Group 1	27.77 (1.88)	19.59 (2.33)
	Group 2	29.19 (1.94)	23.06 (2.40)
	Group 3	30.31 (2.15)	21.39 (2.66)
	Group 4	32.07 (2.07)	23.29 (2.56)
	<i>Subscale 2</i>	<i>(Fear of Harm)</i> <sup>3</sup>	
	Group 1	29.82 (1.90)	24.47 (2.33)
	Group 2	29.06 (1.96)	24.88 (2.40)
	Group 3	35.23 (2.17)	27.39 (2.66)
	Group 4	33.71 (2.10)	27.50 (2.56)

*Note:* Values in parenthesis represent the standard error of the mean.

<sup>1</sup> At pre-treatment there were no differences between conditions,  $F(3, 56) = 1.46$ ,  $p = ns$ ,  $\eta^2 = .07$ .

<sup>2</sup> At pre-treatment there were no differences between conditions,  $F(3, 56) = .842$ ,  $p = ns$ ,  $\eta^2 = .04$ .

<sup>3</sup> At pre-treatment there were no differences between conditions,  $F(3, 56) = 2.15$ ,  $p = ns$ ,  $\eta^2 = .10$ .

## Discussion

The aim of the final study of this research program was to replicate Study 1 with a higher anxiety sample, re-operationalised counting (distraction) tasks, and a more sensitive behavioural measure of anxiety. With these methodological changes in place, the aim was to further investigate and extend on the Johnstone and Page (2004, 2007b, 2007c) studies that have found a beneficial effect of distraction and an interaction

between fear-level and distraction-load, such that higher levels of anxiety benefit more from high distraction loads, and low levels of anxiety benefit more from low distraction loads. In the current study, as with Study 1, levels of distraction varied for each experimental condition across the two exposure sessions, and fear reduction was assessed via in-session subjective fear ratings, physiological arousal in conjunction with a behavioural approach task, and a standardised questionnaire regarding the cognitive and behavioural avoidance of spiders (FSQ).

Prior to discussing the major findings of Study 3, it is important to note that the screening procedure implemented in the current study was successful in its aim to recruit a higher-anxiety sample. This finding is based on comparisons made between Study 1 and Study 3 on FSQ scores, SUD ratings and BAT steps achieved at pre-treatment. This significant increase in the level of pre-treatment stimulus-bound anxiety of the current sample is important, as it overcomes one of the limitations of Study 1 that was considered to be partly responsible for the non-significant group differences in achieved BAT steps, and also to provide an account of why a high-load distracter in the first exposure session (i.e., group 1; HL-LL) did not hold strong benefits for the Study 1 sample, when compared to those who underwent a low-load distracter in the first exposure session (i.e., group 4 (LL-LL)).

In the current study, all groups experienced significant activation from baseline on all physiological measures. This physiological activation holds theoretical significance given the emotional processing model's prediction that the use of any form

of distraction during exposure minimises the encoding of fear-relevant information, hence impeding the activation of fear, and ultimately prevents dissociation between the elements in the fear network (Foa & Kozak, 1986, 1998). Failure to activate fear would be evidenced by non-significant increases in physiological indices of fear from baseline to the initial few seconds of exposure. As activation did in fact occur for all participants in the present study, regardless of experimental condition, it calls into question the explanatory power of this theoretical model.

### **Overall Treatment Effectiveness of Distracted Exposure**

In addition to demonstrating significant physiological activation from baseline, the results of this study confirmed that fear significantly reduced for all groups, indicating that the exposure treatment was successful (a finding which the emotional processing model has difficulty explaining). More importantly, the results demonstrate that exposure treatment was effective under distracted conditions. As was the case with Study 1, the prediction that all experimental groups would experience significant fear reduction from pre-treatment to post-treatment under distracted conditions was confirmed. Regardless of experimental condition, all groups demonstrated a significant reduction in subjective fear ratings both within- and between-exposure sessions. This finding is in keeping with Study 1 of this research program, and previous research by Craske et al. (1991), Penfold and Page (1999), Oliver and Page (2003, 2008) and Johnstone and Page (2004, 2007c), who also found a beneficial effect of distraction with regard to subjective ratings.

As predicted, this significant fear reduction, observed in subjective ratings of anxiety, also generalised to the behavioural response system, with significant increases in steps achieved over time on the BAT from pre- to post-treatment for all participants (regardless of experimental condition). In addition, the prediction that significant decreases in anxiety would generalise to the FSQ was confirmed by a significant decrease in both total and subscale scores on the FSQ from pre-treatment to post-treatment, indicating that participants' general level of responsiveness to spiders significantly reduced.

Also as predicted, this significant reduction in stimulus-bound anxiety generalised to physiological indices where a significant within- and between-exposure session reduction was found for both systolic and diastolic blood pressure. With regard to heart rate, however, there was a significant between-exposure session reduction in anxiety for all participants, but not a significant within-exposure session reduction. This finding was unexpected and not in keeping with heart rate data from Study 1. It also indicates the presence of desynchrony both *within* the physiological response system and, more generally, *between* the subjective, behavioural and physiological response systems. As mentioned previously, desynchrony *between* response systems has occurred in many previous distraction studies, particularly between the subjective and physiological response systems (i.e., Craske et al., 1991; Grayson et al., 1986; Johnstone & Page, 2004; Oliver & Page, 2003). Desynchrony *within* the physiological response system is also not uncommon, with heart rate being a particularly problematic physical measure of anxiety change. For instance, Rodriguez and Craske (1995) found

that heart rate actually increased during their exposure treatment and, subsequently, recommended future research avoid reliance on heart rate as a sole physiological index of fear reduction. Earlier studies that relied exclusively on heart rate as their only physiological measure of anxiety were obviously unable to contribute to the discussion on desynchrony *within* the physiological response system, but Rodriguez and Craske (1993), in their review of these earlier distraction studies, report a trend for heart rate not to show significant decreases within session. Desynchrony *within* the physiological response system, as observed in the present study, indicates the caution that should be taken when interpreting data from a single channel of physiological reactivity.

The present program of study (inclusive of Study 1 and Study 3) attempted to overcome the limitations inherent in relying on limited physiological measures and attempted to provide a more comprehensive insight into physiological habituation. Future research should incorporate several measures of physiological responding, in conjunction with the subjective and behavioural response systems, rather than drawing conclusions based on physiological changes alone, which was the case with many of the earlier distraction studies. Johnstone and Page (2004) measured skin conductivity levels, as further means to rule out desynchronous findings. However, inconsistencies occurred, with this measure occasionally demonstrating significant within-sessions reductions but not between-session (Johnstone & Page, 2004) and, at another time, demonstrating between-sessions advantages but not within (Johnstone & Page, 2007b). This measure was also unreliable, in that it did not consistently demonstrate group

differences consistent with other physiological measures (Johnstone & Page, 2004) and, for this reason, was excluded from the present program of study.

### **Interaction between Fear Level and Distraction Load (Specific to Experimental Condition)**

The hypothesis that individuals with relatively higher levels of stimulus-bound fear would benefit more from a higher-load distracter and those with lower levels of stimulus-bound anxiety would benefit more from a lower-load distracter was partially supported. Measures of systolic and diastolic blood pressure, taken during both exposure sessions, not only demonstrated a significant within- and between-session reduction in fear, but they also, as predicted, demonstrated that the rate of this reduction was not the same for each group.

Specifically, with regard to systolic blood pressure ratings, the change profile observed on this measure in the present study supports the hypothesis that high-load, followed by low-load distraction (as experienced in group 1) results in significantly greater anxiety reduction than any other distraction load combination. This finding was expected, due to fear level being matched with distraction load during *both* exposure sessions. In addition, group 3 (LL-HL) demonstrated the least amount of anxiety reduction on this measure, which makes sense considering the literature regarding the interaction between fear level and distraction load, as these were matched in *neither* exposure session for this group. In keeping with this change profile, group 2 (HL-HL) and group 4 (LL-LL) had a moderate amount of anxiety reduction, as fear-level and

distraction load were matched in one exposure session but not the other. Whilst group 1 (HL-LL) had significantly greater anxiety reduction than all other groups, as measured by systolic blood pressure, group 3 (LL-HL), group 2 (HL-HL) and group 4 (LL-LL) all had anxiety reduce at roughly the same rate (i.e., there were no significant differences between these groups). This finding was unexpected and difficult to account for within the current framework. It is possible that, for reasons other than the distraction load, the particular participants in group 1 (HL-LL) responded particularly well to the exposure treatment. Given that there were no group differences on this measure at pre-treatment, however, it makes it unlikely that these participants would hold any significant advantage over participants in the other experimental groups.

Group differences on diastolic blood pressure showed a similar change profile to that of systolic blood pressure. As predicted, group 1 (HL-LL) had the largest reduction in diastolic blood pressure, with significantly greater reductions than group 3 (LL-HL) and group 4 (LL-LL) but, surprisingly, not group 2 (HL-HL). This latter finding indicates that undergoing a high-load distracter in the second exposure session did not detrimentally impact on this sample's anxiety reduction as much as initially predicted. However, as predicted, group 2 (HL-HL) also experienced significantly greater anxiety reduction than group 3 (LL-HL), indicating that the use of low-load distraction when anxiety levels are relatively higher (in the first exposure session) was less beneficial. Unexpectedly, group 4 (LL-LL) experienced a similar rate of anxiety reduction to group 3 (LL-HL), adding further weight to the finding that the use of a high-load distracter in the second exposure did not have the predicted detrimental effect on anxiety reduction.



Findings from both systolic and diastolic blood pressure measures showed almost an equal amount of expected versus unexpected findings and it, therefore, becomes difficult to use the significant group differences to support the predicted change profile. Group 1 (HL-LL) appeared to demonstrate an advantage over the other groups, in terms of anxiety reduction across both blood pressure measures, but this result was not consistent enough to be able to draw solid conclusions about the performance of groups. Several of the unexpected findings, however, indicate that the use of a high-load distracter in the second exposure session did not significantly slow the rate of anxiety reduction, as was initially anticipated<sup>28</sup>. Theoretically, the use of a high-load distracter in the second exposure session where fear was lower should have reduced the relative benefit of distraction, as at least some focus of attention is required for modification of the fear network. In other words, for those undergoing high-load distraction in the second exposure (where fear is lower), fear reduction should have slowed, due to too much attention being absorbed by the distracter, disallowing sufficient corrective stimulus-relevant to enter the fear network. The findings related to blood pressure in the current study, however, do not support this, as it seems high- and low-load distracters resulted in a similar level of anxiety reduction when used in the second exposure.

The hypothesis that participants undergoing high-load followed by low-load distraction (group 1) would demonstrate the greatest reduction in anxiety on the

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<sup>28</sup> The unexpected findings referred to here are: group 4's (LL-LL) anxiety reducing at a similar rate to that of group 3's (LL-HL) for systolic and diastolic blood pressure, and group 1's (HL-LL) anxiety reducing at a similar rate to that of group 2's (HL-HL) for diastolic blood pressure.

behavioural measure (BAT) was not supported. Group 3 (LL-HL) was hypothesised to have the smallest increase in steps completed on the BAT from pre- to post-treatment. However, further analysis determined that this group had the largest increase in completed BAT steps from pre- to post-treatment, with significantly greater steps achieved than group 2 (HL-HL). Group 1 (HL-LL) had the next largest increase in BAT steps achieved, again with significantly greater steps achieved when compared with group 2 (HL-HL). From these findings it appears that participants in group 2 (HL-HL) completed fewer BAT steps from pre- to post-treatment than hypothesised, but it should be noted that these participants completed more steps at the pre-treatment BAT than any other group, which may partially account for this finding<sup>29</sup>. The finding that group 1 (HL-LL) and group 3 (LL-HL) completed a similar amount of steps from pre- to post-treatment, however, is unexpected and does not offer support to the hypothesised change profile.

Very few studies have found a significant group difference on their behavioural measure of anxiety (i.e., Johnstone & Page, 2007b; Mohlman & Zinbarg, 2000; Penfold & Page, 1999; Rodriguez & Craske, 1995), but the present study took some measures to iron out methodological problems (present in Study 1) with the insensitivity of the BAT and relatively low-anxiety level of the sample, in an attempt to overcome the lack of significant group differences in previous studies. It appears, though, that if it were not for the unusually high pre-treatment BAT scores for group 2 (HL-HL), the BAT would not have shown any significant group differences at all, irrespective of the

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<sup>29</sup> This was not significant at the .05 level but approached significance ( $p=.09$ )

methodological changes made, and it therefore remains an unreliable (i.e., insensitive) indicator of the interaction between fear level and distraction load.

Despite the significant group differences on blood pressure (systolic and diastolic) and on the behavioural measure of anxiety, these group differences did not generalise to measures of heart rate, the FSQ scores or, more importantly, the subjective ratings of anxiety which represents the primary index of anxiety reduction (Rachman, 1998). This pattern of findings was unexpected, particularly due to the significant group differences found with subjective ratings of anxiety in Study 1. It was predicted that if a higher-anxiety sample was recruited for the current replication study, participants' fear networks would be more cohesive and therefore more easily activated, allowing greater opportunity for group differences to be detected. As previously discussed, the screening procedure implemented in the current study was successful in its aim to recruit a higher-anxiety sample for the current study. (This is based on comparisons made between Study 1 and Study 3 on FSQ scores, SUD ratings and BAT steps achieved at pre-treatment). What must be taken into consideration, however, is the possibility that levels of stimulus-bound fear in Study 1 might have been so exceptionally low (as participants only needed to report minimal spider-fear to be eligible for participation) that, despite the significant increase in stimulus-bound fear in the current study, the current sample may still not have had fear levels high enough (or a fear network cohesive enough) to offset the previously noted limitations inherent with a relatively low anxiety sample. The low stimulus-bound fear level of the sample may have contributed to the observed desynchrony between the response systems and lack of significant group

differences. Future studies should therefore aim to recruit spider-*phobic* as opposed to spider-*fearful* individuals, in keeping with the Johnstone and Page (2004, 2007b, 2007c) studies, to be able to assess group differences more adequately and limit desynchronous findings.

In addition, a vast majority of previous studies (excluding Johnstone & Page, 2007c) made comparisons between quite different experimental conditions (i.e., a distraction condition versus a focusing condition), rather than comparing experimental conditions with varying levels of distraction (as was the case with the current study). It may be likely that the changes in anxiety and load manipulation across the different experimental groups in the present study were too subtle to detect significant group differences, making an interaction between distraction load and anxiety level unlikely.

Another limitation with regard to the present study involves the use of an objective check of attention via counting errors made during each exposure session. As with Study 1, a check of counting errors was included as a means of ensuring that participants took the counting task seriously, and also that irregular counting patterns could be ruled out as a possible explanation for any group differences on the dependent variables (i.e., check that the integrity of the experimental manipulation was maintained). In addition, counting error rates provided an indication (in as much as is possible) of how much or how little a counting task loaded on working memory. It was assumed that the more difficult the counting task, the more demand was placed on participants' working memory, and ultimately, the more counting errors would occur.

As seen in Study 2 however, counting error rate is not always a reliable indicator of working memory load. It was assumed in the present study that for group 1 (HL-LL), when fewer counting errors occurred during exposure 2, that less working memory was being used. In addition, it was also assumed that for participants in group 3 (LL-HL), when counting errors significantly increased during exposure 2, that this was indicative of an increase in working memory load of the task. It could be argued that these groups were not considered in need of operationalising using a CPT in Study 2, as practice effects were not suspected. Regardless, it is acknowledged that for counting errors for each experimental group to be compared in a reliable, valid and theoretically meaningful way, all counting tasks used as distraction should have been operationalised, so that relevant CPT data for all groups could have been compared and contrasted effectively. Operationalising *all* counting tasks in Study 2, not just those where practice effects were suspected, would have also meant that we would not have had to rely exclusively in Study 3 on counting error rate for groups 1 and 3 as the primary index of working memory.

The third and final study of this research program further demonstrated that despite cognitive attention being allocated to a stimulus-irrelevant counting task designed to tax working memory, anxiety reduction can still occur (as evidenced by physiological, subjective and behavioural reductions both within- and between-exposure sessions for all participants)<sup>30</sup>. Theoretically, this finding may offer some support to the notion that limiting the rehearsal of meaning information during exposure (i.e., allowing

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<sup>30</sup> This excludes the non-significant within-session reduction for heart rate.

more corrective information into the fear network as opposed to less) has a beneficial effect on fear reduction. This finding is in direct opposition to the emotional processing model's predictions about the use of distraction during exposure and offers support to the notion that limiting conscious access to spider-relevant (fear-saturated) thoughts while the fear network is activated can result in significant fear reduction.

With regard to the interaction of fear level and distraction load, the current study did not find sufficiently consistent support for the hypothesis that a high-load distracter followed by a low-load distracter would result in significantly more rapid fear reduction than other fear/load combinations. Perhaps due to some of the limitations outlined above, it was not possible to create optimal conditions where just the right amount of attention was absorbed by the distracter, thereby allowing just the right amount of corrective stimulus-relevant information into the focus of attention, for rapid fear reduction to occur. If, in the context of the embedded process model, optimal distraction advantage occurs when cognitive rehearsal of fear-saturated thoughts is limited, but where enough corrective meaning information is still available for integration and modification of the network, then future studies should endeavour to further operationalise and refine distraction tasks of varying loads for use with varying fear levels over time, to more adequately assess this delicate relationship.

## Chapter 5

### General Discussion

The present program of study aimed to further explore the use of distraction during *in vivo* exposure for spider fears. Theoretically, the emotional processing model has dominated our understanding of the mechanisms of change underlying fear reduction for some time. This model makes largely negative predictions about the use of distraction, claiming among other things, that distraction introduces ‘fear-irrelevant’ information into the fear network, which interferes with the availability of corrective information necessary to reduce fear (Foa & Kozak, 1986, 1998). Given that several studies exist that demonstrate support for the use of distraction during exposure as a more rapid fear reduction technique than focusing, the present program of study aimed to further explore the potentially beneficial effects of distraction on a sample of spider-fearful participants, whilst overcoming some of the methodological problems inherent in previous studies. Further, the present program of study aimed to examine more closely, the interaction between fear level and distraction load observed in previous studies. In those studies participants with high stimulus-bound anxiety benefitted more from a high-load cognitive distracter, whereas low stimulus-bound anxiety benefitted more from a low-load cognitive distracter (Johnstone & Page, 2004, 2007b, 2007c). The current studies built upon the Johnstone and Page studies that successfully operationalised distraction through assessing the working memory load of distraction tasks. A brief summary of findings from the current studies will be presented here along with limitations and considerations for future distraction research. Finally, the three

studies that this research program comprises will be discussed with regard to their theoretical and clinical implications.

### **Summary of the Main Findings of the Research Program**

Study 1 aimed to replicate and extend previous studies that have found a beneficial effect of distraction, and assess how high- and low-load counting-based distracters, operationalised using a continuous performance task (CPT) loading on working memory, interact with fear level over time with a sample of spider-fearful individuals. Specifically, it was hypothesised that a fear level-distraction load interaction would be demonstrated, with participants of relatively high levels of stimulus-bound fear benefitting from a high-load distracter in the first exposure, while those with relatively low stimulus-bound fear benefitting from a low-load distracter in the second exposure. Contrary to the emotional processing model's prediction, results demonstrated that distracted exposure was effective for all groups, regardless of distraction load, as evidenced by within- and between- exposure session reductions in fear (as assessed by subjective, behavioural, and physiological indices). Subjective ratings of anxiety demonstrated partial support for the fear level-distraction load interaction. However, results were contaminated by practice effects on the distracter task for the groups intended to have constant load across both exposure sessions and by the relatively low anxiety sample used.

Study 2 aimed to overcome the problem of practice effects of the distraction tasks observed in Study 1 for individuals repeating the same counting task for both



exposure sessions. A CPT (as used in the Johnstone and Page studies; 2007a, 2007c)) was used, while participants simulated the counting tasks from Study 1 (specifically, those that required participants to repeat the same counting task during both exposure sessions). Based on preliminary analysis of counting error rates for each experimental group across time in Study 1, it was predicted that practice effects would be present for participants simulating group 2's (HL-HL; counting backwards by threes during both exposure sessions) distraction task, but not for those simulating group 4's (LL-LL; counting backwards by ones during both exposure sessions) distraction task due to the presence of floor effects. These hypotheses were confirmed. Study 2, therefore, also successfully operationalised a replacement distraction task for the HL-HL condition where practice effects were confirmed. This task involved introducing a more difficult counting task at time 2 to offset this confound and maintain stable working memory load across time.

Study 3 applied the newly operationalised counting-based distraction tasks to a higher anxiety sample of spider-fearful participants in a replication of Study 1. It was again predicted that all groups would experience a reduction in fear, further supporting the beneficial effects of distracted exposure, and that the fear level-distraction load interaction would be demonstrated. Support for fear reduction occurring under distracted conditions was found, with both within- and between-exposure session reductions on most indices for all groups. The interaction between fear-level and distraction-load was partially supported, as evidenced by blood pressure ratings. However, desynchrony between the response systems meant that the trend did not

generalise to subjective indices. Ceiling effects in the BAT, meant that it was even more difficult to detect any interaction, if indeed one was present. The results of the present research program offer support for the effectiveness of distracted exposure, but overall, they do not support an interaction between working memory load and fear level.

### **Methodological Strengths**

#### **Limiting further variability.**

The present program of study aimed to overcome some of the limitations of previous distraction studies and improve upon methodological problems that may have contributed to the diversity of findings within the literature. One of the broader aims was to refrain from introducing further methodological variability into the distraction literature, due to the already existing confusion surrounding the variation in findings. As previously outlined, studies vary widely in terms of their choice of distracter, phobic population, and how fear is measured, resulting in little consolidation of knowledge and few conclusions about the theoretical and clinical utility of distraction. This aim was achieved in that the current program of study undertook a replication of Johnstone and Page (2004, 2007a, 2007b, 2007c) and the majority of materials, participants, and procedures were kept the same, except where outlined earlier.

#### **Use of operationalised distracters.**

Possibly the most valuable contribution to the literature made by the present program of study is the use of Johnstone and Page's method for operationalising working memory to serve as the distraction task, rather than introducing yet another

non-quantifiable distracter. The use of Johnstone and Page's operationalised counting-based distracter, to the author's knowledge, offered the most accurate indicator of working memory (and associated distraction load) used within the distraction literature available to date and, in this sense, created the opportunity to explore the delicate relationship between fear level and distraction load. For instance, it would have been both less helpful theoretically and methodologically unsound to compare levels of an unoperationalised distracter (such as describing the physical features of a plant, as used in the Mohlman and Zinbarg (2000) study) and the effect on fear level over time. In addition, the present study also included both visual and cognitive checks of attention to ensure, in as much as is possible, the allocation of participants' attention. The visual check of attention used in Studies 1 and 3 was self-report only. It is acknowledged that this is not ideal, due to the problems inherent in participants' subjective evaluations of their own performance. The check of cognitive attention, (rate of counting errors), however, was modelled from Johnstone and Page's (2007c) study and, although it was not without its limitations, offered a method of assessing how much or how little a counting (i.e., distraction) task loaded on working memory. Possibly its greatest strength, however, was its ability to ensure that participants would be more likely to take the counting task seriously, while also serving as a method of ensuring that the integrity of the experimental manipulation was maintained.

### **Number and duration of exposure sessions.**

The exposure-based studies (i.e., Studies 1 and 3) in the current research program increased the number and duration of exposure sessions. As previously

discussed, some studies, such as Penfold and Page (1999), contained only one exposure session, thereby limiting analysis of results to within-session (i.e., short-term) reductions in anxiety. The current program of study took into consideration more recent studies, such as Johnstone and Page (2004, 2007b, 2007c) and Oliver and Page (2003, 2008) that had participants undergoing more than one exposure session, so that between-session (i.e., longer-term) anxiety reduction could also be assessed. The current results, therefore, offered further support for between-session as well as within-session reductions in anxiety under distracted conditions. The current research program also extended the duration of live exposure sessions, as a test of the emotional processing model's argument that any distraction advantage noted within the literature occurred where relatively short exposure sessions were used. It is argued that distraction may aid short-term fear reduction by limiting the salience of the feared stimuli (Rodriguez & Craske, 1993). In the context of the emotional processing model, the distraction advantage is argued to represent temporary and incomplete emotional processing, due to the improper encoding of stimulus representations in the fear network, as opposed to dissociation of the representations resulting from effective emotional processing. The results of the exposure studies within the current research program render this interpretation untenable. The extension of exposure session duration also enabled assessment of between-session (longer-term) anxiety reduction, in order to build upon existing findings and further establish the boundary conditions of distraction.

### **Categorisation of participants' anxiety.**

The present program of study also implemented an alternative method of categorising participants' anxiety into high and low anxiety groups. As previously discussed, distraction studies to-date have categorised participants' anxiety levels into high or low-anxiety at pre-treatment. This categorisation is usually based on their performance on a pre-treatment behavioural approach task (Johnstone & Page, 2004; Penfold & Page, 1999) or their pre-treatment SUD ratings (2007b, 2007c). The problem inherent in categorising stimulus-bound anxiety at pre-treatment is that it does not take into consideration the decrease in anxiety that naturally occurs when habituation takes place in the presence of the feared stimuli. This decrease then renders the pre-treatment categorisation of fear levels less relevant, when examining the interaction between anxiety level and distraction load *over time*, as fear levels cannot be held constant. Although the hypotheses related to how the specific experimental groups' fear level would change over time were not supported overall, it remains likely that having the various experimental groups undergo different distraction loads at different times throughout the experimental procedure offers the best available method of being able to assess the fear/load interaction.

### **Methodological Limitations**

#### **Lack of follow-up exposure session.**

The present program of study did not incorporate a follow-up session into the procedure for participants undergoing exposure treatment in Study 1 and Study 3, due to restrictions with regards to the scope of the research program and time constraints. This

lack of follow-up represents a limitation, as longer-term anxiety reduction was not able to be assessed. According to the emotional processing model, longer-term anxiety reduction (i.e., assessed days or weeks after the initial exposure treatment) is the product of the accumulation of corrective information that has modified participants' beliefs regarding the threatening stimuli (Foa & Kozak, 1986). An improvement for future studies to consider would be to include one or more follow-up sessions, up to 4-6 weeks after the initial exposure session. Not only would this enable a greater degree of comparison between studies, with regard to longer-term anxiety reduction, but it would offer further valuable evidence as to the effectiveness of distracted exposure and further consolidation of findings within the distraction literature.

#### **Unreliability of physiological measures.**

Although it was predicted that the rate of blood pressure change would not be the same for each group, it was not expected that blood pressure would represent the strongest support for the predicted change profile, because not only were there non-significant group differences in blood pressure in Study 1, but also numerous studies within the distraction literature that have consistently found non-significant group differences on this measure (i.e., Johnstone & Page, 2004, 2007b, 2007c; Oliver & Page, 2003). It is difficult to determine how reliable blood pressure measures are as a true index of anxiety change and, therefore, how much support they offer to our hypothesised interaction, in the absence of any other significant findings relating to our hypothesised interaction between anxiety level and distraction load. It is likely that, in the present study, the complexity of the relationship between physiology, cognition,

emotion and behaviour was somewhat underestimated. Although the concept of desynchrony was introduced and discussed as a possible explanation for the variation within physiological measurements of anxiety, and also between physiological, subjective and behavioural response systems, we may have underestimated the influence of cognitive factors on physiological responding.

Psychophysiological-based research has explored vagally mediated heart rate variability (HRV) and its relationship to working memory and attention (Bucks & Seljos, 1994; Hansen, Johnsen, & Thayer, 2003; Middleton, Sharma, Agouzoul, Sahakian, & Robbins, 1999; Veltman & Gaillard, 1998). Heart rate variability refers to the fluctuation in the interbeat-interval between normal heart rates, and research has demonstrated that HRV significantly reduces during periods of sustained attention (Hansen et al., 2003). Although an in-depth discussion of the specific physiological mechanisms of this interaction and the associated research are outside the scope of the current thesis, a brief explanation is warranted of how this relationship may impact on the physiological measures utilised within the research program.

As described in Veltman and Gaillard (1998), changes in blood pressure are followed by subsequent changes in heart rate to bring the blood pressure back to a “set point”. This feedback loop is governed by the autonomic nervous system (comprising sympathetic and parasympathetic branches). An increase in parasympathetic activity followed by a decrease in sympathetic activity leads to a subsequent decrease in heart rate. As mental effort suppresses the cardiovascular control system’s activity, the

relationship between changes in blood pressure and heart rate becomes weaker, resulting in a reduction in HRV. More specifically, research has demonstrated, through using a continuous memory task that, as working memory load increased, people who performed well in the task had significantly smaller heart rate variability decreases, as opposed to the poorer performers who experienced significantly larger heart rate variability decreases (Backs & Seljos, 1994). Research has also demonstrated that overall heart rate and blood pressure variability were significantly influenced by executive and attentional tasks, offering further support to the finding that physiological measures are sensitive to cognitive tasks (Middleton et al., 1999). This finding was also supported by research by Hansen et al. (2003) who, in keeping with Middleton et al. (1999), found decreased HRV during presentation of attentional tasks that involved aspects of working memory.

Although research has consistently demonstrated associations between cardiovascular response and a wide variety of task variables utilising working memory, little theoretical consensus exists in terms of a comprehensive explanation for this complex relationship. If heart rate variability decreases as task-load or mental effort increases, it is likely that finding any group differences in distraction-based studies becomes increasingly difficult, especially when comparing levels of distraction, as opposed to studies that compare distraction conditions with focusing conditions. Further, as participants in focusing conditions are not required to engage in any tasks that tax their working memory or require a sustained period of attention to a complex task, it is likely that their heart rate variation will remain unaffected by the influences



outlined above. It is not unreasonable then to conclude that studies comparing one group whose heart rate variability is unlikely to be affected by working memory load (e.g. a focusing condition) to a group where cognitive load impacts on heart rate variability (e.g. a distraction condition) has more chance of finding significant group differences on physiological measures.

In the planning of the current research program, the impact of working memory load and task difficulty on the reliability of physiological measures was not considered. It is acknowledged that this underestimation of the complexity of the relationship between cognitive load, working memory and physiology represents a confound that will need to be addressed in future distraction studies, so that physiological measures are not just considered a stand-alone outcome variable that provides information about participants' anxiety level.

Future research may also wish to consider measuring skin conductance level (SCL) in conjunction with heart rate and blood pressure to offer a more comprehensive overview of physiological reactivity. SCL refers to an electrodermal measure that is typically useful in assessing autonomic nervous system activity brought on by stress, as SCL is highly influenced by the sympathetic nervous system which is predominant when individuals encounter stressful situations (El-Sheikh, 2007). Johnstone and Page (2004, 2007b, 2007c) used SCL as an additional physiological measurement, due to evidence that suggests that this particular physiological index may be more reliable than heart rate and blood pressure, particularly in short-term studies where reliability of

electrodermal activity is measured within a single testing session (Boucsein, 1992). While SCL measurement may be a useful adjunct to existing physiological measures, the current research program did not have access to the materials necessary to reliably measure SCL for the duration of the testing period. However, future distraction studies using SCL may be able to provide a more reliable and comprehensive pattern of physiological responding, a particularly important consideration when exploring the interaction between anxiety level and distraction load, due to the ease with which this relationship can be contaminated by extraneous variables.

#### **Affective quality of the distraction task.**

Another potential limitation of the current research is the rather distressing nature of the distraction task selected. It was necessary to select a task that would allow us to easily operationalise distraction load in a way that would allow participants' performance (and associated working memory load) to be evaluated. Backwards counting was selected as the distracter, based on the Johnstone and Page studies that we aimed to replicate. Participants were informed that their counting would be recorded with an audio device and that their counting error rate would be assessed. This information was essential due to research demonstrating that participants are more likely to hold their attention towards tasks that they have been instructed (or strongly encouraged) to complete (Levy & Pashler, 2001; Pashler, 2000). It was necessary for participants to be aware that concentration on the counting task was important, and informing them that their counting would be evaluated represented means of communicating this. It was not anticipated, however, that the counting task itself might

have represented an anxious stimulus for some participants and, therefore, it is entirely possible that participants having to count aloud in front of the researcher with the knowledge that their counting accuracy was going to be assessed, confounded our results. For instance, particularly with regard to Study 1, where participants had significantly lower spider-related fear than in Study 3, it may be that within- and between-session reductions in anxiety partly reflected a habituation to counting aloud. This possibility was also noted anecdotally, with a few participants reporting that they found the counting task even more stressful than having to sit so close to the spider. Rodriguez and Craske (1993) have referred to this as “affective response to the distracter” and have hypothesised that it may be responsible for needless increases in physiological responding. It is unclear exactly how this confound could have been completely eradicated, when it was essential that the participants were informed that their counting would be evaluated, not only because counting served as means of evaluating working memory load, but also because, ethically, participants needed to be informed of exactly what information was being collected about them.

#### **Distraction load manipulation potentially too subtle.**

Another potential limitation, related to the counting-based distraction task, is the likelihood that the counting tasks, representing high- and low- working memory loads, were not sufficiently different when used with the non-phobic samples (in Studies 1 and 3) to be able to detect group differences. It should be noted that prior to the use of the selected counting tasks in Study 1 of the present program of study, the same counting tasks were operationalised by Johnstone and Page (2007c). Both low-load (counting

backwards by ones) and high-load (counting backwards by threes) counting tasks were found to be significantly distracting, when compared with the no distraction (non-counting) condition, as determined by hit rate and reaction time data (Johnstone & Page, 2007c). The counting tasks were also confirmed to load significantly differently on working memory, as participants had significantly higher reaction times and lower hit rates in the high-load condition, when compared to those in the low-load condition (Johnstone & Page, 2007c). Johnstone and Page found a significant interaction between anxiety level and distraction load, with those participants highest in fear experiencing the most rapid fear reduction when undergoing the high-load distraction, and those lowest in fear experiencing the most rapid fear reduction when undergoing low-load distraction. Future studies should aim to operationalise counting-based distraction tasks that differ to a greater degree, to overcome this confound.

### **Selection of fearful as opposed to phobic sample.**

It is possible that the present program of study did not find support for the Johnstone and Page (2007c) interaction due to the difference in fear level of the respective samples. Johnstone and Page selected a phobic sample (i.e., all participants met criteria for specific phobia), compared to the present study where only a minimal level of spider-fear was required to meet criteria for Study 1, and a moderate level of spider fear was required to meet criteria for Study 3. Studies demonstrating the beneficial effects of distracted exposure on anxiety reduction have typically compared a distraction condition to a focusing condition, and used a phobic sample (e.g. Johnstone & Page, 2004, 2007b, 2007c). The present study, however, compared levels of

distraction with a fearful, as opposed to phobic population, which may not have allowed the optimal conditions to adequately assess the delicate relationship between anxiety level and distraction load and, in turn, produce any significant and theoretically meaningful group differences. In addition, having a larger sample size for each study would have been preferable as it may have increased the likelihood of detecting smaller, more subtle effects. It was intended that a fearful, as opposed to a phobic, sample be recruited for Studies 1 and 3 of the present research program, in order to see whether the interaction effects found in the Johnstone and Page (2007c) study would generalise to a less-fearful sample. Although this was considered a meaningful extension of the Johnstone and Page when planning the present series of studies, it would have been prudent to recruit a phobic sample again, in order to examine the impact of our varying distraction loads over time. Future studies that aim to explore the relationship between anxiety level and distraction load would, therefore, be advised to do so with a phobic, as opposed to fearful, sample.

### **Discrepancy in counting duration between studies.**

One final methodological consideration with regard to the counting tasks lies in the disparity between the duration for which participants were required to count backwards in Study 2 (the CPT study) and in Studies 1 and 3 (the exposure studies). During Study 2, participants were required to undergo the CPT whilst counting backwards for approximately 4 minutes. Task duration was designed to be relatively short, in order to minimise the risk of fatigue effects and the associated contamination of data and to provide valuable information about working memory load (Ballard, 2001).

The decision to limit the duration of the CPT was intentional, since if fatigue effects occurred, group differences pertaining to working memory may become virtually undetectable. The relative benefit of this decision to limit CPT duration in Study 2 may be offset, however, by the uncertainty of the stability of working memory load, when these counting tasks were used for 20-minute durations in Study 3. As participants in Study 2 were not required to count backwards for a full 20 minutes whilst CPT output data was analysed, it remains uncertain how stable the working memory loads remained over time when used in Study 3. Future studies would benefit from addressing these issues in operationalising distraction tasks. Specifically, participants could undergo a CPT over varying periods of time, to determine the duration that could be used for distracted exposure that would both allow enough time for fear reduction to take place, yet not too long that practice effects occur and contaminate the stability of working memory load.

## **Implications of the Research Program**

### **Theoretical implications about the use of distraction during exposure.**

The findings of the present research program support the use of cognitive distraction during exposure and do not offer support to the emotional processing model. To recapitulate, Foa and Kozak specify that the main requirement for fear reduction to occur is full attention to the feared stimulus and complete activation of the fear network in memory. More specifically, they view distraction as “fear irrelevant” information that prevents maximum corrective information from being incorporated into the network. They propose that the detrimental effects of distracted exposure will show as

minimal subjective, physiological, and behavioural anxiety reduction (Foa & Kozak, 1986, 1998). The present research program, however, demonstrated significant within- and between-group reductions in anxiety on all subjective, physiological<sup>31</sup>, and behavioural indices for participants in Studies 1 and 3, demonstrating that fear reduction *can* in fact occur under distracted conditions.

The emotional processing model also specifies that, in order for fear reduction to occur, the fear network must first be activated (Foa & Kozak, 1986, 1998). The model also predicts that the use of distracted exposure will inhibit network activation and that this will be evidenced in non-significant increases in physiological responding from baseline (rest). The present program of study did not support this central tenet of the emotional processing model, as all physiological measures (i.e., heart rate, systolic and diastolic blood pressure) demonstrated significant increases from rest under distracted conditions. Early bioinformational models of fear suggest that only a small match between the stimulus and fear network is required for activation to occur in phobic samples (Lang, 1977). Although the participants from Studies 1 and 3 did not meet criteria for a phobic level of fear, it has been demonstrated here, that even a fearful (as opposed to phobic) population can experience physiological activation under distracted conditions.

The findings from the present research program regarding the use of distraction during exposure cannot adequately be accounted for by the emotional processing model

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<sup>31</sup> This excludes within-session reduction in heart rate in Study 3 that did not show a significant reduction.

and, in conjunction with the Johnstone and Page (2004, 2007b, 2007c) studies, offers further support to the notion that distracted exposure may allow more, not less, corrective information into the fear network, through the limiting of catastrophic cognitions (i.e., meaning elements) during network activation, hence allowing faster dissociation between elements of the fear network and more rapid fear reduction. Cowan's (1995, 1999) embedded processes model offers more explanatory power for the finding that fear reduction can occur under distracted conditions within the context of information processing-based literature. Within this model, it is proposed that information does not need to be consciously attended to, in order to create and maintain the activation of fear. Thus, the exposure context, can explain how a participant's attention can be largely dedicated to thinking about the distraction task (focus of attention), whilst still being able to attend to, and process, information about the feared stimuli (activated fear network in long-term memory). Cowan's model offers a rationale for the use of distraction during exposure, as it acknowledges that both the information in the focus of attention, as well as the subset of long-term memory (i.e., the fear network) can result in the formation of new links, and the eradication of old links as the network structure transforms and fear reduces in the exposure context. Given the emotional processing model's difficulty in accounting for the beneficial effects of distracted exposure, it calls into question the need for Foa and Kozak to revise their model's proposed mechanisms, particularly in light of information processing based theories which appear to better account for these findings.



With regard to the interaction of fear level and distraction load, the embedded processes model offered a framework for hypothesising that higher levels of fear, when matched with higher levels of distraction, would result in more rapid anxiety reduction. Ideally, the distraction-based studies in the current research program aimed to limit only partially the rehearsal of catastrophic cognitions, so that some of the focus of attention was still able to be allocated to the meaning elements (i.e., fear-related cognitions) of the fear network in long-term memory across both exposure sessions. This is why it was predicted that participants with higher levels of anxiety (in exposure 1), when matched with a higher level of distraction, and participants with lower levels of anxiety (in exposure 2), when matched with lower distraction loads, would provide the optimal conditions to maintain this attentional balance over time. The embedded processes model specifies that information that is activated within the focus of attention will be able to be modified more readily, hence allowing more rapid dissociation between the elements of the fear network and, therefore, more rapid anxiety reduction. Given this, it was important that distraction tasks did not completely overtake the focus of attention, resulting in insufficient attention being dedicated to the feared stimulus. The exposure-based studies in the present research program attempted to improve on previous methodologies in order to best utilise the embedded processes model in trying to establish this optimal balance.

Previous distraction studies have traditionally categorised participants' stimulus-bound anxiety at pre-treatment (usually into high vs. low anxiety groups). This categorisation does not provide useful information as to how anxiety changes under

distracted conditions over time, as habituation occurs in the presence of the feared stimuli. Further, within the context of the embedded processes model, it proves difficult to ascertain whether the focus of attention has been maintained at the optimal level. The exposure-based studies in the current research program aimed to alter distraction load over time to further investigate the anxiety level - distraction load interaction and provide further data pertaining to the optimal attentional allocation. Due to some of the limitations discussed above with regard to the counting (distraction) tasks, it remained difficult to determine the absolute attentional allocation at any point in the exposure process. Despite objective checks of cognitive attention, the non-significant group differences did not support the anxiety level-distraction load interaction. It is likely, however, that the attempt at trying to improve this aspect of previous methodologies used in the distraction literature has still provided a useful framework for future studies to build upon.

Overall, the emotional processing model struggles to account for the activation of fear under distracted conditions, the reduction in stimulus-bound anxiety that occurs during distracted exposure, and also the emerging literature suggestive of an interaction between anxiety level and distraction load. Foa et al. (2006) attempt to explain away the beneficial effects of distracted exposure by suggesting that the studies that have demonstrated beneficial effects of distracted exposure have not been true distraction studies, claiming that “decreased attention” to a stimulus is not the same thing as “distraction”. Even still, the emotional processing model has difficulty accounting for these findings, as the model specifies full attention to the feared stimulus is required.

In addition, it is suggested that the studies demonstrating beneficial effects of distraction vary methodologically and, therefore, are difficult to compare and contrast in a meaningful way (Foa et al., 2006). This is indeed true and is one of the problems the present research has attempted to overcome by building and extending on previous studies (e.g. Johnstone & Page, 2004, 2007b, 2007c; Oliver & Page, 2003, 2008; Penfold & Page, 1999). Further replication within the distraction literature is important, in order to rule out the problem of methodological variation and to encourage a focus on the emotional processing model's proposed mechanisms. As Doss (2004) contends, more replication studies need to be conducted so that less research alters multiple variables at once, further contributing to the ambiguity in the change mechanism literature. Moreover, Foa et al. (2006) argue that a limitation of existing distraction research is that the anxious population typically suffer from specific phobias and suggest that if distraction is used with other anxious populations, this beneficial effect may be lost. The importance of replicating and extending existing distraction studies with different anxious populations is paramount. Only then can we more thoroughly test the limits of the emotional processing theory and determine whether Foa et al.'s dismissive explanation of the benefits of distraction holds true, or whether a review of the emotional processing model's proposed change mechanisms is warranted.

### **Broad implications for mechanisms of change research.**

The notion that the use of distraction during exposure is detrimental and should be avoided has little empirical support. The lack of consistency in the distraction

research and the lack of agreement on what constitutes distraction has led to confusion and a lack of unity within the psychological community about its use with various client populations. This has meant that Foa and Kozak's (1986, 1998) emotional processing model (complete with its negative, but largely unsubstantiated views about distraction), has dominated both theory and practice.

Other models, however, may be able to offer a more comprehensive explanation of how fear reduces and also account for the beneficial effects of distraction. One example is Tryon's (2005) connectionist model that claims cognitions, emotions and behaviours change simultaneously, thereby overcoming debate from cognitive models that argue behavioural and emotional change follow changes in thinking, and affective models that predict emotional changes precede behavioural and cognitive changes. As change (i.e., fear reduction) during exposure is preceded by dissonance in the network, distraction can be seen as introducing a greater amount of dissonance into the network which results in more rapid fear reduction. The increased dissonance in the network and subsequent beneficial effect of distraction can be explained by having the participant stay in the presence of the feared stimuli, whilst being unable to fully engage the catastrophic thoughts characteristic of the phobic experience.

Although Tryon's (2005) formal network model offers a unique and potentially more comprehensive explanation of fear reduction under distracted conditions, it is not without its flaws and has been criticised for being overly complex, due to the difficulty inherent in verbally explaining the model and its reliance on computer simulations to

outline, test and monitor predictions. Given the difficulty inherent in finding psychologists with the mathematical expertise necessary to understand and apply these computerised mathematical models to an exposure context, it remains a relatively unexplored theory to date. Tryon stresses that, at some point, the results and findings sourced from the scientific hypothesis testing process need to be placed in an explanatory context. He argues that mature science not only makes testable predictions, but provides explanatory theories as well. In other words, answers need to continue to be sought as to *why* treatment techniques work, as opposed to simply looking at *what* works.

Further, Doss (2004) highlights that, for many years, the driving focus of change mechanism research has looked at what treatments, by whom, are most effective for specific people in specific circumstances. Despite the number of studies conducted regarding the efficacy of psychological treatments, relatively little is known about the mechanisms of change underlying them (Doss, 2004). Kazdin (1999), who has conducted extensive research into change mechanisms underlying psychological treatment, argues that there could be no worse agenda than this and, instead, promotes an agenda that focuses on change mechanisms that explore *how* treatments work.

Specific to the exposure context, the various theoretical models discussed in detail in Chapter 1 have different explanations for how anxiety reduces during exposure therapy and it is easy to see the confusion and ambiguity that exists when these models are compared. The need to invest resources into treatment principles, as opposed to

treatment techniques, could not be more evident (Carey, 2011). In his recent review of these models, Carey noted that there appears to be an unwritten agreement that exposure therapy facilitates a process of reorganising elements of a network or system in such a way that connections are weakened by consonance seeking or disconfirmatory experiences which re-establish stability to the network. It is unsettling at best that this remains the one general point of agreement across models, and further highlights the need for studies investigating mechanisms of change. Studies examining the use of distraction during exposure represent merely one example of change mechanism research that would shed further light on this debate.

### **Clinical implications for the use of distraction during exposure.**

Investing time in research exploring the mechanisms of change underlying psychological therapies holds clinical as well as theoretical implications. Identifying specific mechanisms responsible for therapeutic change can create more time-effective and flexible therapy options for clinicians, as unessential elements of therapies could be eliminated (Kazdin, 2001). Improving the efficiency of psychological therapies by understanding and incorporating the core mechanisms both focuses on bringing about the reduction of anxious symptomology and would do so at less cost to individuals and services at large (Carey, 2011).

Due to the overwhelming popularity Foa and Kozak's (1986) emotional processing model received upon publication and in the years following this, it has dominated our theoretical understanding of fear reduction and is likely responsible for

the ambiguity among clinicians conducting exposure therapy with clients. In addition, the studies that have demonstrated beneficial effects of distraction during exposure have done so fairly recently. Had these studies been conducted around the same time as the emotional processing model emerged, Foa and Kozak's model may not have dominated our theoretical and practical understanding of fear and how it operates to the same extent, and practical uses of distraction during exposure therapy in a therapy setting may have been further explored.

Due to the lack of consolidation of research demonstrating the beneficial effects of distraction and, more broadly, in conjunction with the lack of research dedicated to change mechanisms, it is likely that clinicians remain uncertain about whether or not to use distraction, with which clients it might be helpful, what sorts of distracters might be useful, and the duration for which to use it. The answers to these questions are paramount, as distress induced by traditional exposure practices (that exclusively involve focusing on the feared stimulus) may also make it more likely that a client will terminate either the session, or therapy in general, early, before desensitisation has occurred, due to the unmanageable SUD levels endured. Distracted exposure offers a valuable tool that has the ability to result in more rapid anxiety reduction, and empower clients by enabling them to persist with exposure tasks in the face of significant anxiety, as opposed to terminating early and reinforcing the cycle of anxiety through avoidance behaviours.

The present program of study provided some useful information pertaining to the use of distraction in a clinical setting. The two exposure studies demonstrated support for its use, due to the significant fear reduction that occurred both within and between exposure sessions. Although support for the hypothesised interaction between fear level and distraction load was not found (which offered little to the development of our theoretical understanding regarding this), this outcome offers some assistance to clinicians, in that there may be little need to worry about getting *just* the right level of distraction for *just* the right level of fear. Based on the studies of Johnstone and Page (2004, 2007b, 2007c), however, it would still be inadvisable to use high distraction loads with a non-phobic sample, and selecting a distraction task free from affective content itself (i.e., one that does not inspire additional anxiety) would be advised. Ultimately, additional distraction studies are required to further establish the boundary conditions around when and how to most effectively use distraction during exposure, so that clinicians can base their practice on empirical evidence, rather than guess-work.

## **Conclusions**

This research program effectively built upon the small but growing body of distraction research in both a theoretically and clinically meaningful way. Few replication studies exist within the distraction literature and this, in conjunction with the dominance of the emotional processing model (Foa & Kozak, 1986) and its negative views on the use of distraction, has created uncertainty both in research and clinical arenas as to the utility of distraction during exposure. Coupled with this, is the broader problem pertaining to the disagreement across the theoretical models that attempt to



explain fear reduction, and the lack of research focused on the mechanisms of change underlying exposure treatment, which has further added to the difficulty in accounting for the beneficial effects of distraction that recent studies have demonstrated.

The results of the present research program did not find support for the emotional processing model. Instead, the findings have been discussed in the context of Cowan's (1995, 1999) embedded processes model of working memory which is at least able to offer some theoretically meaningful explanation for how fear reduction can occur under distracted conditions. By contrast, Foa et al. (2006) attempted to explain away the beneficial effects based on the variations between studies' participant populations, definitions of distraction, and methodologies.

In essence, the current results offer support for the use of distraction during exposure with a spider-fearful population. Although the hypothesised fear level – distraction load interaction was not supported, the study offers a unique method for assessing this interaction over time, with an operationalised distracter and objective checks of cognitive attention that future studies may wish to build on in an effort to learn more about the boundary conditions of distraction, and contribute meaningfully to the change mechanism literature.

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**APPENDIX A: Study 1 Noticeboard Advertisement****VOLUNTEERS NEEDED!**

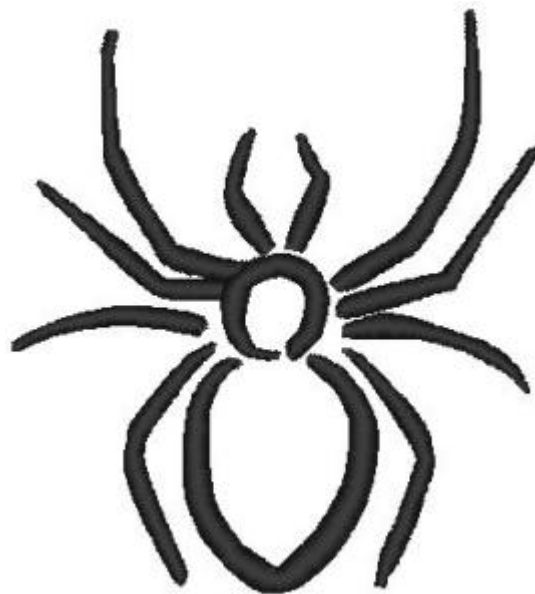
*If you saw a spider right now would you be afraid of it?*

*Do you feel nervous when you see spiders?*

*Do you have little confidence that you'd be able to deal effectively with a spider if you came across one?*

If you answered 'yes' to any of these questions, you may like to participate in a study being conducted through the School of Psychology that aims to look at the therapeutic benefits of exposure when treating spider phobias. If you'd like to participate, you'll be asked to fill in some questionnaires, do various tasks like hold a picture of a spider and look at a spider in a tray. We'll also measure your blood pressure and heart rate. It is estimated that participation in this experiment will take a maximum of 90 minutes. So if you, or anyone else you know would answer yes to the above questions and could benefit from some exposure therapy, please contact Samantha Ellis (Student Researcher) on \*\*\*\* \* or Dr. Kristy Johnstone (Chief Investigator) on 9360 2290. Participation in this study is voluntary and you are free to withdraw at any time.

We look forward to hearing from you!



## Appendix B: Newspaper Article (Melville Times)



### Samantha examines fear factor

MANY people are terrified of spiders but Coolbellup resident Samantha Ellis is so fascinated by arachnophobia that she is researching it for her Masters of Clinical Psychology at Murdoch University.

Ms Ellis is calling for volunteers to help with research examining the therapeutic benefits of exposure therapy, which involves exposing a person fearful of something to the object or situation they fear.

Ms Ellis said phobias were very common, with about 60 per cent of adults reporting some fears and 11.25 per cent diagnosed with a specific phobia during their lifetime.

"Phobias affect individuals of all ages and it is thought that we are naturally predisposed to fear some things rather than others because of the danger they represent," she said. "Spider phobia is of particular interest to me as not only is it common, but can cause an extreme fear, sometimes limiting an individual's life due to extreme avoidance."

Ms Ellis is using black house spiders because they are timid and commonly found. Anyone interested should call 0413 277 091.

**Clinical psychology trainee Samantha Ellis is looking for volunteers for her research project.** Picture: Martin Kennealey

www.communitypix.com.au d290880a

### Appendix C: Fear of Spiders Questionnaire (FSQ)

Listed below are a number of statements concerning spiders. Please read each statement carefully and, on the 0-5 scale given, indicate how much you think *each* statement is typical of *you*.

	0 -----	1 -----	2 -----	3 -----	4 -----	5
	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
1.	If I came across a spider now, I would get help from someone else to remove it.					_____
2.	Currently, I am sometimes on the look out for spiders.					_____
3.	If I saw a spider now, I would think it will harm me.					_____
4.	I now think a lot about spiders.					_____
5.	I would be somewhat afraid to enter a room now, where I have seen a spider before.					_____
6.	I now would do anything to try to avoid a spider.					_____
7.	Currently, I sometimes think about getting bitten by a spider.					_____
8.	If I encountered a spider now, I wouldn't be able to deal effectively with it.					_____
9.	If I encountered a spider now, it would take a long time to get it out of my mind.					_____
10.	If I came across a spider now, I would leave the room.					_____
11.	If I saw a spider now, I would think it would try and jump on me.					_____
12.	If I saw a spider now, I would ask someone else to kill it.					_____
13.	If I encountered a spider now, I would have images of it trying to get me.					_____
14.	If I saw a spider now I would be afraid of it.					_____
15.	If I saw a spider now, I would feel very panicky.					_____
16.	Spiders are one of my worst fears.					_____
17.	I would feel very nervous if I saw a spider now.					_____
18.	If I saw a spider now I would probably break out in a sweat and my heart would beat faster.					_____

**Please check that you have answered all the questions you intended to.**

## Appendix D: Anxiety Disorders Interview Schedule for DSM-IV (ADIS)

0-----1-----2-----3-----4-----5-----6-----7-----8  
 no fear/ mild fear/ moderate fear/ severe fear/ very severe fear/  
 never avoids rarely avoids sometimes avoids often avoids always avoids

### Currently, do you fear or feel a need to avoid spiders?

Rate fear according to scale above \_\_\_\_\_

Rate avoidance according to scale above \_\_\_\_\_

How often does the feared situation arise?

\_\_\_\_\_

(0= never 8= always)

For your fear of spiders;

**What are you concerned will happen in this situation?**

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### Do you experience the anxiety nearly every time you encounter spiders?

Yes / No (circle)

### Is the anxiety response immediate (as soon as you encounter a spider)

Yes / No (circle)

### Symptoms

**Circle the symptoms you experience when you encounter spiders**

**Rate how severe each of these symptoms is when you encounter spiders**

0-----1-----2-----3-----4-----5-----6-----7-----8  
 None Mild Moderate Severe Very Severe

- |    |   |          |
|----|---|----------|
| a. | Palpitations, pounding heart, or accelerated heart rate | Yes / No |
|    | Severity _____  |          |
| b. | Sweating  | Yes / No |
|    | Severity _____  |          |
| c. | Trembling or shaking                                    | Yes / No |
|    | Severity _____  |          |
| d. | Shortness of breath or smothering sensations            | Yes / No |
|    | Severity _____  |          |
| e. | Feeling of choking                                      | Yes / No |
|    | Severity _____  |          |
| f. | Chest pain or discomfort                                | Yes / No |
|    | Severity _____  |          |

- |    |  |          |
|----|--|----------|
| g. | Nausea or stomach distress<br>Severity _____                                   | Yes / No |
| h. | Chills, hot flushes, or blushing<br>Severity _____                             | Yes / No |
| i. | Dizziness, unsteady feelings, light-headedness, or faintness<br>Severity _____ | Yes / No |
| j. | Feelings of unreality or being detached from oneself<br>Severity _____         | Yes / No |
| k. | Numbing or tingling sensations<br>Severity _____                               | Yes / No |
| l. | Fear of dying<br>Severity _____  | Yes / No |
| m. | Fear of going crazy<br>Severity _____  | Yes / No |
| n. | Fear of doing something uncontrolled<br>Severity _____                         | Yes / No |

**In what ways has this fear interfered with your life (e.g., daily routine, job, social activities)?**

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**Rate interference on the following scale (circle)**

0-----1-----2-----3-----4-----5-----6-----7-----8  
 None                      Mild                      Moderate                      Severe      Very Severe

**Rate how much are you bothered by this fear or your level of distress about having the fear (circle)**

0-----1-----2-----3-----4-----5-----6-----7-----8  
 None                      Mild                      Moderate                      Severe      Very Severe

**Do you think that your fear of spiders is excessive or unreasonable? Yes / No(circle)**  
**Why?**

(Even if your answer is 'no', please explain why you *don't think* your fear is excessive or unreasonable)

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**Appendix E: SUD Visual Analogue Scale**

**SUD Scale**

**0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10**

No Fear

Moderate

Very  
Severe

—

## Appendix F: Behavioural Approach Task (BAT)

*Tick for achieved, cross for not achieved.*

- |            |   |       |   |
|------------|---|-------|---|
| <b>10.</b> | Touch spider with a small brush                                   | _____ | ↑ |
| <b>9.</b>  | Put bare hand inside container, 5cms from spider                  | _____ |   |
| <b>8.</b>  | Put gloved hand inside container, 5cms from spider                | _____ |   |
| <b>7.</b>  | Have face level with tarantula in open container 10 cms from face | _____ |   |
| <b>6.</b>  | Look down at tarantula in an open container (30cms from face)     | _____ |   |
| <b>5.</b>  | Place hand against container near tarantula in closed container   | _____ |   |
| <b>4.</b>  | Stand 30 cms from tarantula and look at it in closed container    | _____ |   |
| <b>3.</b>  | Stand 2 meters from a tarantula in a closed container             | _____ |   |
| <b>2.</b>  | Watch 45 seconds of tarantula footage                             | _____ |   |
| <b>1.</b>  | Hold a picture of a spider for 10 seconds                         | _____ |   |



**Appendix G:           BAT Step 1 (Photo of *Eurypelma Spinicrus*)**



**Appendix H: BAT Steps 3 to 10 (Actual *Eurypelma Spinicrus* used)**



## Appendix I: Study 1 Counting Task Instructions (High-Load Task)

You will now be asked to sit in front of a live spider that will crawl around in an open glass tray. It is essential to the experiment that you maintain visual attention to the spider, that is, you must **watch it at all times**.

For the 20 minutes that you watch the spider you will be required to **count backwards in threes from 700**. You will hear “beeps” at 3-second intervals, between which you are required to say the next number in sequence. For example between each beep you might say “700, 697, 694, 691...”

To make the counting process more efficient, say the numbers as follows; “six-ninety seven, six-ninety four, six-ninety one...” (rather than “six hundred and ninety seven”). This will make it easier for you to repeat the numbers within the 3-seconds. Importantly, you **must** say a number in every 3-second gap.

Finally, **it is essential that you don’t make any mistakes while counting**. You **MUST** make a **lot of effort NOT to make any mistakes**. If you make mistakes your data may be useless and you may be asked to complete further testing. If you do make a mistake or lose your place, keep counting from the closest number you can think of. And remember you must say a number in every 3-second gap.

At intervals during the session I will be asking you to rate “how much fear you feel RIGHT NOW” from 0-10 (show scale). After you have answered, begin counting again from the last number you said (or as close to that number as you can).

Throughout the exposure session you **must keep visually focused on the spider at all times**.

## Appendix J: Study 1 Counting Task Instructions (Low-Load Task)

You will now be asked to sit in front of a live spider that will crawl around in an open glass tray. It is essential to the experiment that you maintain visual attention to the spider, that is, you must **watch it at all times**.

For the 20 minutes that you watch the spider you will be required to **count backwards in ones from 700**. You will hear “beeps” at 3-second intervals, between which you are required to say the next number in sequence. For example between each beep you might say “700, 699, 698, 697...”

To make the counting process more efficient, say the numbers as follows; “six-ninety nine, six-ninety eight, six-ninety seven...” (rather than “six hundred and ninety nine”). This will make it easier for you to repeat the numbers within the 3-seconds. Importantly, you **must** say a number in every 3-second gap.

Finally, **it is essential that you don’t make any mistakes while counting**. You **MUST** make a **lot of effort NOT to make any mistakes**. If you make mistakes your data may be useless and you may be asked to complete further testing. If you do make a mistake or lose your place, keep counting from the closest number you can think of. And remember you must say a number in every 3-second gap.

At intervals during the session I will be asking you to rate “how much fear you feel RIGHT NOW” from 0-10 (show scale). After you have answered, begin counting again from the last number you said (or as close to that number as you can).

Throughout the exposure session you **must keep visually focused on the spider at all times**.

## Appendix K: Study 1 Manipulation checks

**Please answer these last few questions related to the study you have just participated in:**

*a) Please rate the percentage (%) of time you spent looking at the spider for each of the 2 live exposure sessions:*

Exposure 1: \_\_\_\_\_ %

Exposure 2: \_\_\_\_\_ %

*b) For the 2 live exposure sessions, please rate the percentage (%) of time the spider was moving:*

Exposure 1: \_\_\_\_\_ %

Exposure 2: \_\_\_\_\_ %

*c) Overall, how much do you think your fear of spiders has reduced?*

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10

None

Some

A  
considerable  
amount

Most

All

## Appendix L: Study 1 Information Letter

### Information Letter

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**Project Title:** *The effect of distraction on anxiety reduction during in-vivo exposure for spider phobia: Assessing the relationship between anxiety level and distraction load over time.*

**Investigator:** Samantha Ellis  
**Telephone:** \*\*\*\* \*  
**email:** samanthaellis81@hotmail.com

**Chief Investigator:**  
 Kristy Johnstone  
 School of Psychology  
 Murdoch University  
 Telephone: (08) 9360 2290

You are invited to participate in this study.

#### Background

It is known that exposure treatment (where the patient is exposed to the stimulus that they are fearful of) has been very successful in treating fear. What isn't so certain however is exactly *how* the reduction in anxiety occurs. There are various theoretical models that attempt to explain how exposure results in anxiety reduction, however none can account for the findings from recent studies that suggest that using distraction during exposure can make exposure more effective.

#### Aim of the Study

The aim of the present study is to investigate the role that distraction plays during exposure and the effect it has on anxiety reduction in people who are fearful of spiders.

#### What Does Your Participation Involve?

Participation in this study involves the completion of two short questionnaires related to the severity of your spider fear; some behavioural tasks related to spiders (i.e., looking at a picture of a spider, gradually moving closer to the spider etc); and two 20 minute exposure sessions, where you will be required to watch a small live spider enclosed in a tray. While you are watching the spider, you will be required to rate your current anxiety level (from 0-10), complete a simple counting task, as well as have your blood pressure and heart rate monitored by a portable device. It is estimated that participation in this experiment will take a maximum of 90 minutes. At the end of the experiment we will measure your blood pressure and heart rate again. Your counting during the exposure will be audio taped so we can check for counting mistakes. The tape will be deleted after you have finished the experiment. It is important to keep in mind that your participation in this study will be kept completely anonymous and all information that is collected will remain strictly confidential.

Your involvement in this study is voluntary, and we respect your right to decline. If you decide to discontinue participation at any time, you may do so without providing an explanation. There will be no consequences to you if you decide not to participate and for those of you part of the subject pool, you

will still be provided course credit. All information will be treated in a confidential manner, and your name will not be used in any publication arising out of the research. All of the research will be kept in a locked cabinet in the office of Dr Kristy Johnstone.

#### **Possible Benefits**

After your participation in the study, it is likely that your fear of spiders will reduce. The spider used for the live exposures is one commonly found in most Australian homes and it is therefore suggested that the anxiety reduction experienced within session may generalise more easily to the home environment. In addition, you are offered the opportunity to gain an understanding of your fear and the treatment used with individuals with higher levels of phobic fear. You can also gain information regarding further treatment for your fear if you would like to pursue further desensitization.

If we are able to take the findings of this small study and link it to similar research being conducted in the wider psychological community, it will assist in improving psychological treatments for anxiety problems, not only phobias but potentially other anxiety disorders as well. It will also increase our understanding about the use of distraction as part of the therapy for fear.

#### **Possible Risks**

It is possible that you may experience feelings of fear and anxiety from the spider exposure. These feelings will only be temporary, as the treatment being conducted alleviates these symptoms of fear fairly rapidly. The spider used for the exposure sessions is not dangerous to humans and is housed in an open glass tray, however it is physically impossible for the spider to escape. You will be debriefed after your participation in the study, however, should you feel the need for further support, you will be able to arrange a further debrief session with myself or alternatively you will be able to access support services through the Murdoch Psychology Clinic.

#### **Questions**

If you would like to discuss any aspect of this study please feel free to contact either myself, Samantha Ellis on \*\*\*\* \* or Dr Kristy Johnstone on 9360 2290. Either of us would be happy to discuss any aspect of the research with you. Once we have analysed the information you have the option of viewing a summary of the results via the Psychology website ([http://www.psychology.murdoch.edu.au/research\\_results.html](http://www.psychology.murdoch.edu.au/research_results.html))

#### **Contact**

My supervisor and I are happy to discuss with you any concerns you may have on how this study has been conducted. If you wish to talk to an independent person about your concerns you can contact Murdoch University's Human Research Ethics Committee on 9360 6677 or email [ethics@murdoch.edu.au](mailto:ethics@murdoch.edu.au)

You can expect the results to be posted on the above-mentioned website no later than the end of October 2008.

We would like to thank you in advance for your assistance with this research project.

**Appendix M: Study 1 Consent Form****Consent Form**

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**Project Title:**

*... The effect of distraction on anxiety reduction during in-vivo exposure for spider phobia: Assessing the relationship between anxiety level and distraction load over time.*

I am a Masters of Clinical Psychology student at Murdoch University investigating the underlying mechanisms of exposure treatment on fear, under the supervision of Dr Kristy Johnstone. The purpose of this study is to investigate the role of distraction during exposure treatment.

You can assist us in this research by consenting to participate in the study. It is expected that the time to complete the experiment will be between 80 and 90 minutes. The experiment consists of the completion of a questionnaire, some behavioural tasks related to spiders (Behavioural Approach Task) and two 20 minute exposure sessions, where you are exposed to a live spider in a glass tray. Throughout the experiment, you will be required to verbally rate your current anxiety level on a scale of 0 – 10, engage in a simple counting task, as well as have your blood pressure and heart rate monitored by a portable device. At no time will you be required to have direct skin contact with the spider.

If you are willing to participate in this study, could you please complete the details below. If you have any questions about this project, please contact either myself, Samantha Ellis, on \*\*\*\* \* or my supervisor, Dr Kristy Johnstone, on 9360 2290.

My supervisor and I are happy to discuss any concerns you may have on how this study has been conducted, or alternatively you can contact Murdoch University's Human Research Ethics Committee on 9360 6677.

- 
1. I (the participant) agree voluntarily to take part in this study.
  2. I have read the Information Sheet provided and been given a full explanation of the purpose of this study, the procedures involved and of what is expected of me. The researcher has answered all my questions and has explained the possible problems that may arise as a result of my participation in this study.
  3. I understand that I will be audio-recorded during the exposure sessions for the purpose of the researcher ensuring that I have completed the counting task correctly. I understand that the researcher will review the tape immediately after my session and will then tape over the recording. I understand that I will remain anonymous throughout this process and no audio-recorded information will be kept from my session.
  4. I understand I am free to withdraw from the study at any time without needing to give any reason.
  5. I understand I will not be identified in any publication arising out of this study.
  6. I understand that my name and identity will be stored separately from the data, and these are accessible only to the investigators. All data provided by me will be analysed anonymously using code numbers.
  7. I understand that all information provided by me is treated as confidential and will not be released by the researcher to a third party unless required to do so by law.

Signature of Participant:	_____	Name: _____	Date: ...../...../.....
Signature of Investigator:	_____	Name: _____	Date: ...../...../.....
Supervisor's Signature:	_____	Name: _____	Date: ...../...../.....



**Appendix N:            Picture of Black House Spider for pre-intervention FSQ**



**Appendix O: Study 1 Screening Tool (Similarity of Spiders Scale)**

*How similar were the spiders you have seen today compared with the 'typical' spiders you are most afraid of?*

0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10

Not at  
all  
similar

Somewhat  
similar

Considerably  
similar

Very  
similar

Exactly  
the  
same

## Appendix P: Study 2 Information Letter

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**Project Title:** *The effect of distraction on anxiety reduction during in-vivo exposure for spider phobia: Assessing the relationship between anxiety level and distraction load over time.*

**Investigator:** Samantha Ellis

**Telephone:** \*\*\*\* \* \* \*

**email:** samanthaellis81@hotmail.com

**Chief Investigator:**  
Dr Suzanne Dziurawiec  
School of Psychology  
Murdoch University  
Telephone: (08) 9360 2388

**Co-Investigator:**  
Dr Kristy Johnstone  
School of Psychology  
Murdoch University  
Telephone: (08) 9360 2290

You are invited to participate in this study.

### Background

The general purpose of this research project is to examine how beneficial the use of distraction is during exposure therapy when treating spider fears. However, for us to be able to understand what sorts of distraction tasks might be helpful when assisting anxious people in overcoming their fears, we first have to determine the best sorts of distraction tasks to use. One way of doing this is to assess how different distraction tasks affect our working memory (our mental working space). Once we establish how distracting a task is using this concept of working memory, we will better be able to successfully apply these distraction tasks to an anxious population with the intent on more rapidly reducing their spider-related fear.

### Aim of the Study

Overall, we aim to independently establish the distraction load (or how distracting a task is) of some counting tasks to be able to effectively use them in our next study with a spider-fearful sample.

### What Does Your Participation Involve?

Participation will involve attending a single 20 minute session where you will be asked to complete a computer task. This task will help us determine how much working memory you are using to complete the task. Specifically, it will involve you sitting in front of a computer screen as a series of letter-pairs are displayed to you on screen. You will be asked to rapidly and correctly identify letter pairs that rhyme with the word 'me' (such as D and E, or B and C). As you complete the task, you will also engage in a counting task that will serve as the distraction. This counting task will be audio taped and checked after the session for errors and then deleted. You will have a practice trial that will run for approximately 2 minutes (where you simply complete the computer task without counting) and you will need to hit 100% accuracy before you can move on to the two 'real' computer tasks (both approximately 4 minutes in duration). You will have a short break of a minute or so between computer task 1 and computer task 2. Error rate, hit rate, reaction time and false hit rate will all be calculated which will ultimately determine how distracting the counting task actually is. It is important to keep in mind that your participation in this study will be kept completely anonymous and all information that is collected will remain strictly confidential.

Your involvement in this study is voluntary, and we respect your right to decline. If you decide to discontinue participation at any time, you may do so without providing an explanation. There will be no consequences to you if you decide not to participate and for those of you part of the subject pool, you will still be provided subject pool credit hours. All information will be treated in a confidential manner, and your name will not be used in any publication arising out of the research. All of the research will be kept in a locked cabinet in the office of Dr Kristy Johnstone.

### **Possible Benefits and Risks**

The nature of the task you are required to complete in the 20-minute timeframe is such that there are deemed to be no significant risks and/or benefits to individuals who participate. The task is a straight-forward computer task performed in combination with a counting task. The only benefit you may encounter might be a sense of contribution to the field by way of participation in this small study.

This study does aim to independently establish the distraction load of the selected counting tasks to be able to effectively use them during exposure with an anxious sample. Currently there are many problems in using the term 'distraction', in research as its definition and use across studies has varied immensely making it difficult to draw conclusions from the data as different researchers have different ideas about what distraction is. The current study will be directly counteracting this problem by using working memory load to clarify and operationalise distraction to bring about some continuity in the research about what constitutes distraction.

### **Questions**

If you would like to discuss any aspect of this study please feel free to contact either myself, Samantha Ellis on \*\*\*\* \* \*\* \*, Dr Kristy Johnstone (9360 2290) or Dr Suzanne Dziurawiec (9360 2388). We would be happy to discuss any aspect of the research with you. Once we have analyzed the information you have the option of viewing a summary of the results via the Psychology website ([http://www.psychology.murdoch.edu.au/research\\_results.html](http://www.psychology.murdoch.edu.au/research_results.html))

### **Contact**

My supervisors and I are happy to discuss with you any concerns you may have on how this study has been conducted. If you wish to talk to an independent person about your concerns you can contact Murdoch University's Human Research Ethics Committee on 9360 6677 or email [ethics@murdoch.edu.au](mailto:ethics@murdoch.edu.au)

You can expect the results to be posted on the above-mentioned website no later than the end of December 2009.

We would like to thank you in advance for your assistance with this research project.

## Appendix Q: Study 2 Consent Form

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### Project Title:

*... The effect of distraction on anxiety reduction during in-vivo exposure for spider phobia: Assessing the relationship between anxiety level and distraction load over time. ...*

My supervisors and I are happy to discuss any concerns you may have on how this study has been conducted, or alternatively you can contact Murdoch University's Human Research Ethics Committee on 9360 6677.

---

1. I (the participant) agree voluntarily to take part in this study.
2. I have read the Information Sheet provided and been given a full explanation of the purpose of this study, the procedures involved and of what is expected of me. The researcher has answered all my questions and has explained the possible problems that may arise as a result of my participation in this study.
3. I understand that I will be audio-recorded during the exposure sessions for the purpose of the researcher ensuring that I have completed the counting task correctly. I understand that the researcher will review the tape immediately after my session and will then tape over the recording. I understand that I will remain anonymous throughout this process and no audio-recorded information will be kept from my session.
4. I understand I am free to withdraw from the study at any time without needing to give any reason.
5. I understand I will not be identified in any publication arising out of this study.
6. I understand that my name and identity will be stored separately from the data, and these are accessible only to the investigators. All data provided by me will be analysed anonymously using code numbers.
7. I understand that all information provided by me is treated as confidential and will not be released by the researcher to a third party unless required to do so by law.

Signature of Participant: \_\_\_\_\_ Name: \_\_\_\_\_ Date: ...../...../.....

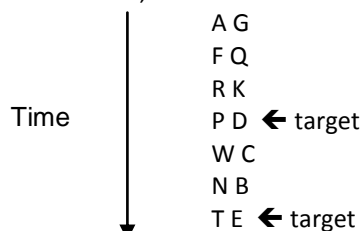
Signature of Investigator: \_\_\_\_\_ Name: \_\_\_\_\_ Date: ...../...../.....

Supervisor's Signature: \_\_\_\_\_ Name: \_\_\_\_\_ Date: ...../...../.....

## Appendix R: Instructions for verbal CPT (High Load)

In this computer task you will be presented with a string of letter pairs (1 every couple of seconds). Your task is to press the space bar every time a 'target' pair of letters is presented.

A 'target' letter pair in this task is any pair of letters that both rhyme with the word 'ME'. For example you might see a string of letter pairs as follows;



In this case you would have pressed the space bar when the letter pair 'P D' was presented, and when the letter pair 'T E' was presented. Some letter pairs may include one letter that rhymes with the word 'ME', but these are NOT targets (e.g., letter pair A G above).

The only time you are required to press the space bar is when both letters in the pair rhyme with the word 'ME'.

You must try to detect the target by pressing the space key as QUICKLY AS POSSIBLE, but you must also be careful not to make errors. It is equally important to respond quickly, as it is accurately.

So try to be as QUICK AND AS ACCURATE AS POSSIBLE.

This task will last for about 4 minutes, and you should be able to complete the task without making any mistakes, and with fairly quick reactions.

As you complete the computer task, you will also complete an out-loud counting task. I will say a number to start counting backwards from, and I want you to count backwards by [insert either 3's or 7's here depending on experimental condition] as ACCURATELY as you can. You will hear "beeps" at 3-second intervals, between which you are required to say the next number in sequence. For example if I said to count backwards...

Select  
statement  
depending  
on condition



in threes from 200 you would say out loud, "200, 197, 194, 191"

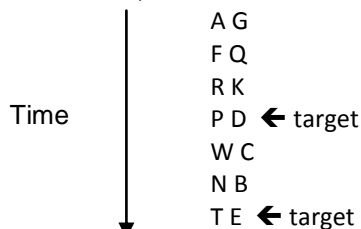
in sevens from 200 you would say out loud, "200, 193, 186, 179"

Most people can complete the task without making any mistakes. To make your counting more efficient count the numbers like this; one-ninety nine, one-ninety eight, one-ninety seven..." (rather than saying "one-hundred and ninety seven"). Finally, it is essential that you don't make any mistakes while counting. You MUST make a lot of effort NOT to make any mistakes. If you make mistakes your data may be useless and you may be asked to complete further testing. If you do make a mistake or lose your place, keep counting from the closest number you can think of. And remember you must say a number in every 3-second gap. REMEMBER: both the computer task and the counting task are of equal importance so you must try very hard not to make errors in either component. Ok, are you ready? I will now say a number and I want you to count backwards by [insert either 3's or 7's here depending on condition] as quickly and as accurately as you can while completing the computer task. Start counting backwards from 900, NOW.

## Appendix S: Instructions for verbal CPT (Low Load)

In this computer task you will be presented with a string of letter pairs (1 every couple of seconds). Your task is to press the space bar every time a 'target' pair of letters is presented.

A 'target' letter pair in this task is any pair of letters that both rhyme with the word 'ME'. For example you might see a string of letter pairs as follows;



In this case you would have pressed the space bar when the letter pair 'P D' was presented, and when the letter pair 'T E' was presented. Some letter pairs may include one letter that rhymes with the word 'ME', but these are NOT targets (e.g., letter pair A G above).

The only time you are required to press the space bar is when both letters in the pair rhyme with the word 'ME'.

You must try to detect the target by pressing the space key as QUICKLY AS POSSIBLE, but you must also be careful not to make errors. It is equally important to respond quickly, as it is accurately.

So try to be as QUICK AND AS ACCURATE AS POSSIBLE.

This task will last for about 4 minutes, and you should be able to complete the task without making any mistakes, and with fairly quick reactions.

As you complete the computer task, you will also complete an out-loud counting task. I will say a number to start counting backwards from, and I want you to count backwards by [insert either 1's or 2's here depending on experimental condition] as ACCURATELY as you can. You will hear "beeps" at 3-second intervals, between which you are required to say the next number in sequence. For example if I said to count backwards...

Select  
statement  
depending  
on condition



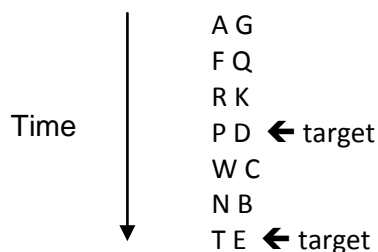
in ones from 200 you would say out loud, "200, 199, 198, 197"

in twos from 200 you would say out loud, "200, 198, 196, 194"

Most people can complete the task without making any mistakes. To make your counting more efficient count the numbers like this; one-ninety nine, one-ninety eight, one-ninety seven..." (rather than saying "one-hundred and ninety seven"). Finally, it is essential that you don't make any mistakes while counting. You MUST make a lot of effort NOT to make any mistakes. If you make mistakes your data may be useless and you may be asked to complete further testing. If you do make a mistake or lose your place, keep counting from the closest number you can think of. And remember you must say a number in every 3-second gap. REMEMBER: both the computer task and the counting task are of equal importance so you must try very hard not to make errors in either component. Ok, are you ready? I will now say a number and I want you to count backwards by [insert either 1's or 2's here depending on condition] as quickly and as accurately as you can while completing the computer task. Start counting backwards from 900, NOW.

## Appendix T: Instructions for verbal CPT (Practice)

In this computer task you will be presented with a string of letter pairs (1 every couple of seconds). Your task is to press the space bar every time a 'target' pair of letters is presented. A 'target' letter pair in this task is any pair of letters that both rhyme with the word 'ME'. For example you might see a string of letter pairs as follows;



In this case you would have pressed the space bar when the letter pair 'P D' was presented, and when the letter pair 'T E' was presented. Some letter pairs may include one letter that rhymes with the word 'ME', but these are NOT targets (e.g., letter pair A G above). The only time you are required to press the space bar is when **both letters in the pair rhyme with the word 'ME'**.

You must try to detect the target by pressing the space key as QUICKLY AS POSSIBLE, but you must also be careful not to make errors. It is equally important to respond quickly, as it is accurately.

So try to be as **QUICK AND AS ACCURATE AS POSSIBLE**.

This practice task will last for about a minute or so, and you should be able to complete the task without making any mistakes, and with fairly quick reactions. Once you hit 100% accuracy we will then proceed to the next stage of computer tasks.



## Appendix U: Educational Material (Overcoming Phobias Worksheet)

# Overcoming Phobias

Phobias involve a strong, irrational fear and avoidance of an object or situation. The person knows the fear is irrational, yet the anxiety remains. Anxiety is an important survival mechanism that prepares our body to either 'fight' or 'escape' in the presence of something threatening. Sometimes however, our mind is tricked into thinking that something is dangerous when it really isn't, creating a false alarm.



## What does anxiety look like?

Everyone is different and no two anxious people will behave exactly the same but there are some similarities that we notice. When people experience anxiety, it tends to affect them in three ways.

**Thoughts:** First, anxiety is experienced in the thoughts that people have (i.e., what runs through their minds). Anxious people will have thoughts that focus on some type of danger or threat. For example, they may worry that they'll be hurt, or not be able to manage the anxiety and do something to embarrass themselves.

**Feelings:** Second, anxiety is experienced physically in the body. When a person becomes anxious, his/her body becomes more 'pumped up' or aroused. This is referred to as the fight or flight response and involves changes in heart rate, an increase in breathing, sweating & nausea.

**Behaviours:** Third and most importantly, anxiety affects how people behave. When individuals are anxious, they may become physically agitated, start shaking or become visibly upset. In addition, anxiety usually involves some type of avoidance (i.e., avoiding places where they will encounter the feared object or situation). This avoidance functions to maintain the anxiety because every time someone escapes a feared situation it is strengthening the association in their mind that the feared object/situation is scary & should be avoided. Treatment then, works at weakening this association by gradual exposure where we can assist the individual in staying in the feared situation long enough for his/her anxiety to subside. They will then start to learn that fear and the object/situation in question don't go together.

## Gradual exposure

There are a few things to keep in mind when doing exposure tasks for phobias.

### 1. Exposure must be gradual.

As the name suggests, exposure must be taken step by step. A hierarchy of feared situations is

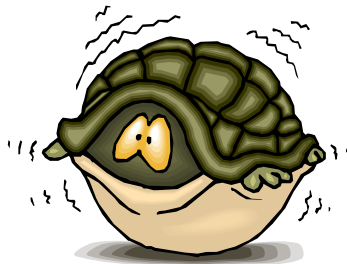


usually put together and the least feared situation is confronted first. This way, the person gains confidence when moving up the hierarchy.

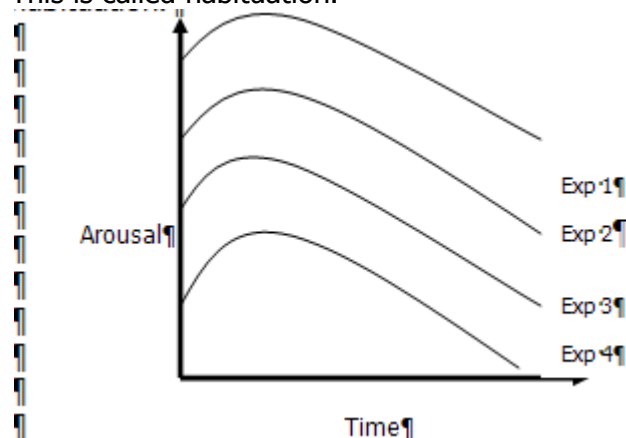
**2. Exposure must be prolonged:** Usually, exposure tasks take between 15-60 minutes. It is important that the person not leave the feared situation until their SUDs (Subjective Units of Distress) reduces by at least 50%. Keep in mind that anxiety is a very fast acting system and therefore will decrease within an hour. It is physically impossible for our bodies to maintain a high state of anxiety for any longer than this.

**3. Exposure must be repeated:**

Exposure to a feared situation once, is not enough for a person to reduce their fear. It is recommended that each feared situation be exposed



at least 4 times. In the graph below, it shows that the first exposure peaks and then gradually reduces. For each subsequent exposure, the anxiety will start out being higher than where the previous exposure finished, BUT lower than where it started. This is called habituation.



The more varied the exposure tasks, the more generalised the effects will be.

**4. Exposure must be functional:** The person needs to be afraid to a level that is significant but manageable during exposure therapy. If the person's SUDs rating is too low, they won't experience the effects of habituation (as pictured above) and subsequent disconfirmation of beliefs about the feared object. If SUDs rating is too high, then there is a serious risk that the person may feel too overwhelmed and will try to escape. By using a hierarchy, this helps ensure that the person is ready to confront the next challenge.



## Appendix V

## Educational Material (Anxiety Cycle for Spider Fear)

